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AN EXAMINATION OF NEW VENTURES GOING THROUGH THE INITIAL PUBLIC OFFERING: THE IMPACT OF FIRM CAPABILITIES AND CHARACTERISTICS ON PERFORMANCE

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AN EXAMINATION OF NEW VENTURES GOING THROUGH THE INITIAL PUBLIC OFFERING: THE IMPACT OF FIRM CAPABILITIES AND CHARACTERISTICS ON PERFORMANCE

A Dissertation APPROVED FOR
THE MICHAEL F. PRICE COLLEGE OF BUSINESS

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AN EXAMINATION OF NEW VENTURES GOING THROUGH THE INITIAL PUBLIC OFFERING: THE IMPACT OF FIRM CAPABILITIES AND CHARACTERISTICS ON PERFORMANCE

ABSTRACT

Entrepreneurship as a field of study generally focuses on the pursuit of new opportunities and the activities of firms engaged in bringing new ideas to financial fruition. Due to their liability of newness, growth and survival are never a certainty for new ventures; indeed, organizational failure is much more common. Those new ventures that do attain a modicum of success often seek to "go public" through an initial public offering (IPO) of their stock in order to raise additional capital. This three-essay dissertation examines the performance of a sample of new ventures both at the time of the IPO as well as one year hence. The first study examines how venture capitalists (VCs) assist their organizations during the post-IPO period. Results suggest that VCs assist their organizations in reacting better to identified threats. The second study examines the nature of the underwriting process and identifies when greater underpricing is expected. Results provide evidence that underwriters pursue greater underpricing when possible (likely in order to create loyalty among their institutional investors). On the other hand, we find that new ventures can mitigate the likelihood of underpricing by reducing their information asymmetry concerning the value of the venture and by demonstrating stronger insider representation on the board of directors. The third study examines how signals impact the new venture at the time of the IPO. We find that the lockup period is often used in lieu of other signals which may be unavailable (such as prestigious underwriter backing or venture capital backing). Ventures with higher uncertainty or performance problems at the time of the IPO can reduce investor uncertainty and concomitantly the amount of underpricing when the lockup period is extended.

Subject Category: Business Administration, Management (0454)

DISSERTATION INTRODUCTION - 3 PAPER SEQUENCE:

1) DYNAMIC CAPABILITIES AND NEW VENTURE PERFORMANCE: THE MODERATING EFFECTS OF VENTURE CAPITALISTS

2) UNDERWRITERS AND THE AGENCY PROBLEM AT THE TIME OF THE IPO: WHEN IS UNDERPRICING MORE LIKELY AND WHEN IS IT LESS LIKELY?

3) SIGNALING IN NEW VENTURES: THE USE AND IMPACT OF THE LOCKUP PERIOD

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DISSERTATION INTRODUCTION

Background

Previous research examining the value of venture capitalists (VCs) to the ventures they back has generally focused either on 1) manager and venture capitalist perceptions of VC value added prior to the IPO (cf. Rosenstein, Bruno, Bygrave, and Taylor 1993; Sapienza 1992; MacMillan, Kulow, and Khoylian 1989; Rosenstein 1988), or on 2) underpricing at the time of the IPO (cf. Barry, Muscarella, Peavy, and Vetsuypens 1990; Megginson and Weiss 1991; Gompers and Lerner, 1999; Busenitz, Arthurs, Hoskisson, and Johnson, 2003). The former research has provided insight into what venture capitalists actually do (for additional insight see also Rosenstein, 1988; Gorman and Sahlman, 1989; Kunze, 1990; Fried and Hisrich, 1995) but has been criticized for its reliance on perceptual measures of performance resulting in questions concerning the internal validity of results (Daily, McDougall, Covin, and Dalton, 2002). Furthermore, these studies have tended to be primarily descriptive (e.g. atheoretical); the end result is that we have a significant lacuna in our understanding of whether and why venture capitalists actually add value to the ventures they back outside of the capital provided (Timmons and Sapienza, 1992; Daily et al., 2002).

The second strain of research (examining underpricing at the time of IPO) has centered on information asymmetries in the pricing of new securities.[1] Researchers have either argued that VCs certify the value of their ventures to high-prestige underwriters

[1] Finance scholars (not focused on venture capitalists) have developed several hypotheses to explain the phenomenon of underpricing (see Jenkinson and Ljungqvist (2002) for an overview).

(Megginson and Weiss, 1991; Carter and Manaster, 1990; Carter, Dark, and Singh, 1998) or that VCs, as experts in governance specializing in certain industries (Amit, Brander, and Zott, 1998; Barry et al., 1990; Busenitz, et al., 2003) minimize the likelihood of opportunism on the part of entrepreneurs. Thus, both streams of research implicitly or explicitly employ agency theory with its focus on the avoidance of adverse selection or the mitigation of moral hazard as the underlying explanation for why the information concerning the value of VC-backed ventures is more easily established thereby resulting in less underpricing and fluctuation in stock price at the time of the IPO.

Venture Capitalists and Post-IPO Venture Performance

Whereas we are beginning to see more studies examining post-IPO performance (cf. Levis, 1993; Hensler, Rutherford, and Springer, 1997; Ensley, Pearson, and Amason, 2002), these studies have not focused on venture capitalists' role in this performance. That is, little research has been developed to identify whether VCs provide value after the IPO or whether they instill a capacity for superior performance after the IPO. Unfortunately, the extant research in this area has either focused solely on a sample of VC-backed firms (Jain, 2001) or has examined much longer-term performance (cf. Jain and Kini 2000) and has been methodologically problematic. For example, Jain and Kini (2000) examined the likelihood of survival of a sample of VC-backed and non-VC-backed IPOs that went through the IPO between 1977-1990. They conducted a hazard/survival analysis and declared that VC-backed ventures were less likely to fail than non-VC-backed ventures over the first five years after the IPO. Unfortunately, their results are questionable given that the non-VC-backed ventures

going through the IPO between 1985-1990 had lower failure rates. Only when you add in the sample of firms that went through the IPO between 1977-1984 do the results confirm their pronouncement. Thus, in their sample, VC-backed ventures that went through the IPO between 1977-1984 had lower 5-year failure rates whereas non-VC-backed ventures that went through the IPO between 1985-1990 had lower 5-year failure rates. Additionally, according to their data (see Table 1 on page 1158 of their study), VC-backed ventures evidence higher rates of failure in the first two years after the IPO (8.91% versus 5.78%). Although a chi-square test of differences in failure rates at the two-year mark is not significant (chi-square 1.81, 1df), the higher rate of failure among VC-backed ventures is problematic nonetheless given that VCs typically remain associated with their ventures on average a year and a half after the IPO (Gompers and Lerner 1998). Indeed, the failure rate among VC-backed firms is higher during the first two years for their entire sample including the firms going through the IPO in the 1977-1984 time period. This study and its results are problematic not just because of the inconsistent failure rates among VC-backed ventures depending on the year of the IPO. Examining survival and even performance of new ventures beyond two years after the IPO and attributing this venture survival or performance to the former ownership of venture capitalists is questionable due to the threats to internal validity posed by mortality (e.g. the departure of VCs from the ventures) (cf. Cook and Campbell, 1979). Unless it can be demonstrated that venture capitalists are still associated with the new venture after two years, or if the researchers can provide a theoretical rationale for why the venture capitalists' earlier involvement would have an enduring impact on their

organizations, attributing the performance and survival of a new venture to VC-involvement beyond the two-year mark after the IPO seems difficult to defend.

IPOs, Venture Capitalists, and New Venture Performance at the IPO and After

With the lack of adequate research in this area to date, I am interested in understanding the issues surrounding the value of VCs to the ventures they back. To this end, I will use my first paper to examine the performance issues surrounding venture capitalist involvement in their ventures after the IPO. The first paper will extend RBV theory and build upon dynamic capabilities in the new venture setting. Specifically, this paper will identify whether VCs help to facilitate dynamic capabilities in new ventures and will examine how well VC-backed new ventures are able to address weaknesses and threats compared to non-VC-backed new ventures.

In addition to understanding the value of venture capitalists, I am interested in understanding how organizations seek to manipulate the IPO process to their advantage. Earlier it was stated that venture capitalists certify the value of their ventures to high prestige underwriters and that historically (in the 1980s) underwriter prestige was negatively associated with underpricing (cf. Megginson and Weiss, 1991). However, since the late 1980s, there has been a reversal in this relationship in that high-prestige underwriters are now associated with greater underpricing (cf. Loughran and Ritter, 2003). Furthermore, underpricing for U.S. IPOs increased dramatically in the 1990s. This underpricing represents wealth that was not retained by the new venture and is generally perceived as a negative for the new venture. Jenkinson and Ljungqvist (2002) document the increasing market power of certain underwriters and believe that the increasing general level of underpricing may be associated with a potential agency

problem between the underwriter (as agent) and the board of the new venture (as principal). With this background, I will extend agency theory elements and examine how board and venture characteristics impact the likelihood of underpricing in my second paper.

Whereas underwriters may seek to manipulate the IPO process in order to maximize their wealth sometimes at the expense of the ventures they underwrite, new ventures may engage in certain behaviors to increase the wealth they attain from the IPO. In particular, they can attempt to signal value to potential investors and reduce the likelihood for adverse selection. Previous research has identified scientific capability, venture capital backing, and prestigious underwriter backing as signals of quality (utilized by new ventures). I am interested here in examining potential signaling behavior by ventures that lack those other signals of quality. Specifically, I am interested in understanding whether the lockup period can be used as a signal. The lockup period is the agreement by current investors (with the underwriter) promising not to sell their shares for a specified length of time after the IPO. It is used to keep the stock price from dropping dramatically after the IPO. As such, my last paper will focus on the lockup period and how it can be used as a potential substitute signal at the time of the IPO when more preferable signals are lacking. In addition to this, I want to examine whether the lockup period can help to overcome unfavorable information. Finally, I want to identify whether the lockup period affects the amount of underpricing at the time of the IPO. My three essays will be more fully described below.

Paper #1 – Dynamic capabilities and new venture performance: The moderating effects of venture capitalists. As noted above, this paper examines the

value of venture capitalists from a dynamic capabilities perspective. Dynamic capability (or capabilities) has been broadly defined as the ability to reconfigure the firm's resource base when needed (Eisenhardt and Martin, 2000). Dynamic capabilities adopts an organizational economics calculus in which the firm is seen as a bundle of heterogeneous resources and capabilities. It is assumed that superior product market performance is the result of the development of capabilities that are valuable, rare, inimitable, and nonsubstitutable (Barney, 1991). Dynamic capabilities allow the organization to make better decisions concerning the resource base (i.e. whether to acquire or divest certain resources) and allow easier resource acquisition and divestiture because they provide greater information and reduce the boundedness and information asymmetries for decision makers. Thus, dynamic capabilities allow the organization to make changes as needed. In this paper, it is argued that venture capitalists endue their ventures with superior dynamic capabilities due to 1) their specialization in certain industries creating a larger knowledge base for wise decision making, and 2) their industry connections allowing the new venture to acquire resources that would otherwise be unavailable (or would be too expensive) without the legitimacy and credibility of the venture capitalists.

In order to test whether VCs endue their organizations with superior dynamic capabilities, the risk factors relating to the venture's products, management team, legal liabilities, and government regulation for each firm are coded. The risk factors are listed in the prospectus for every new venture going through an IPO and signal the need for dynamic capabilities because they represent potential weaknesses and/or threats to the new ventures' future performance and survival. The one-year Sharpe's measure

(Sharpe, 1966) (e.g. the one-year risk-adjusted stock price returns controlling for market effects) is used as the dependent variable because the market should incorporate how well each firm addresses these weaknesses and threats. By examining the interaction effects between VC-backing and each risk factor, we are able to test whether VC-backed ventures attain superior post-IPO performance compared to the non-VC-backed ventures. A post-hoc analysis is performed among the VC-backed ventures with a management and/or a product-related risk factor. In this post-hoc analysis, the experience of the VCs (including industry experience, the amount of experience the VC has with the particular venture as well as venture capital experience) as well as the VCs reputation (measured as the number of other boards on which they serve as well as a reputation score based on the Carter and Manaster (1990) scale) are used to predict the Sharpe's measure at the one-year mark.

Paper #2 – Underwriters and the agency problem at the time of the IPO: When is underpricing more likely and when is it less likely? The second paper will examine the agency problem which arises between the new venture issuing stock at the IPO and the underwriter employed to assist the new venture in the "going public" process. An enigma associated with IPOs is the persistence of underpricing (Jenkinson and Ljungqvist, 2002). Underpricing is generally defined as the difference in the offer price minus the first day closing price divided by the offer price (Daily, Certo, Dalton, and Roengpitya, 2003). This underpricing represents money "left on the table" that the new venture forgoes and is thus generally detrimental for the new venture. A new venture's liquidity is particularly important owing to its liability of newness (cf. Singh, Tucker, and House, 1986). Given the importance of wealth retention for ongoing

organizational success, strategic management scholars are becoming more interested in examining the issues surrounding underpricing. For example, Certo, Covin, Daily, and Dalton (2001), using an eclectic theoretical approach, examine how the existence of a founder interacts with the composition of the board of directors to either promote or reduce underpricing. Similarly, on a UK sample of firms, Filatotchev and Bishop (2002) examine how executive characteristics affected the composition of the board for new ventures going through the IPO. They observed significantly less underpricing in their sample of firms among those where more than a third of the directors on the board were nonexecutives. However, neither study addresses the relationship that develops between the underwriter and the new venture and how the new venture's board characteristics can reduce underpricing. This particular study seeks to fill this gap.

It would seem that underwriters would prefer less underpricing since their remuneration comes primarily in the form of an underwriting fee based on the offer price as their compensation (Chen and Ritter, 2000). Yet underwriters have conflicting interests in that they must please their institutional investors in order to secure investors for future deals. Those institutional investors willing to reveal greater demand information in the book building process (whereby the demand for shares according to the share price is established) and who tend to hold on to their shares of stock for longer periods after the IPO (to maintain the stability of the share price) are particularly valuable to underwriters. Since these institutional investors benefit from underpricing (e.g. buying low and later selling much higher), underwriters have an incentive to underprice in order to continue attracting their business. Given the principal-agent relationship between underwriters and the new venture employing them as well as the

existence of clearly conflicting goals between them, the existence of periodic underpricing is not surprising. However, what is puzzling is that significant underpricing persists and has increased since 1990. Jenkinson and Ljungqvist (2002) argue that increasing market power among large underwriters combined with increasing underpricing is symptomatic of a persistent agency problem and they call for further research in this area. By examining board characteristics and new venture characteristics and relating them to concepts established by agency theory, I will examine how they impact the likelihood of underpricing at the time of the IPO.

Paper #3 – Signaling in new ventures: The use and impact of the lockup period. Researchers have proposed that signaling can act to reduce the information asymmetry and reduce investors' uncertainty (Leland and Pyle, 1977; Welch, 1989; Grinblatt and Hwang, 1989; Deeds, DeCarolis, and Coombs, 1997; Helou and Park, 2001; Certo, 2003) concerning the value of a new venture. Whereas most signaling models are predicated on providing a signal of the inherent quality of the firm, I am interested here in examining signaling as a means to overcome unfavorable information concerning the firm. In particular, I will examine the lock-up period as a potential signal. I am seeking to determine whether it is used as a substitute when signals of higher quality are not available. Additionally, I am interested in probing the impact of the length of the lock-up period and how it affects the level of underpricing at the time of the IPO.

The lockup agreement prohibits current shareholders from selling any of their shares of stock for a period of time after the IPO. Whereas the typical lock-up period is for 180 days (Bradley, Jordan, Yi, and Roten, 2001), pre-IPO shareholders often agree to

longer periods of time. According to Field and Hanka (2001), lockups act as a signal to investors that key employees will remain with the firm for a period of time and further signal that insiders are not seeking to cash out in advance of imminent bad news. Prior research on lock-ups has focused on the returns and trading activity surrounding the lockup expiration. For example, finance scholars have found that venture capital backed stocks typically suffer a significant abnormal return around the expiration of the lock-up period (Bradley et al., 2001; Field and Hanka, 2001) as well as a spike in trading activity (Garfinkle, Malkiel, and Bontas, 2002). However, this same abnormal return is not evident among non-venture capitalist backed stocks. On the other hand, both types of ventures suffer negative abnormal returns around an underwriter's early release from the lock-up with even worse returns for venture capitalist backed stocks (Keasler, 2001).

In this study, using elements of transaction cost economics and signaling theory, I will examine whether the lockup period acts as a substitute for signals of quality (of the new venture) when other signals such as venture capitalist backing, underwriter prestige, and strong scientific capabilities are lacking. Furthermore, I will examine whether ventures exhibiting unfavorable information (in their prospectus) utilize a longer lockup period to assuage investor concerns. Lastly, I will examine the amount of underpricing associated with new ventures that adopt longer lockup periods.

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DYNAMIC CAPABILITIES AND NEW VENTURE PERFORMANCE: THE MODERATING EFFECTS OF VENTURE CAPITALISTS

ABSTRACT

After going through the IPO, new ventures face increased competition, greater public examination, and increased government scrutiny. Resource base weaknesses and external forces pose severe threats to the survival and success of new ventures. Building off of RBV theory, we first examine and demarcate dynamic capabilities from entrepreneurial capabilities in entrepreneurship. We then develop theory to explain how VCs endue their ventures with greater dynamic capabilities in order to address these weaknesses and threats. We test our hypotheses on a match pair sample of VC-backed and non-VC backed new ventures and find that VC-backed ventures demonstrate greater dynamic capabilities as they relate to product and management development but do not display any greater dynamic capabilities as they relate to legal and government regulation threats.

DYNAMIC CAPABILITIES AND NEW VENTURE PERFORMANCE: THE MODERATING EFFECTS OF VENTURE CAPITALISTS

INTRODUCTION

Venture capitalists (VCs) are active investors that take equity positions in ventures that might otherwise be unable to acquire adequate financing (Jeng and Wells 2000; Amit, Brander, and Zott 1998; Sahlman 1990). Due to their expertise with investing in entrepreneurial ventures often in specific industries, VCs frequently assist entrepreneurs with strategic issues through their periodic dialogue as well as their role on the board of directors (Timmons and Bygrave, 1986; MacMillan et al. 1989; Fried and Hisrich 1995). VCs can also serve as intermediaries between lenders and entrepreneurs (Daily, McDougall, Covin, and Dalton 2002). VC involvement may also provide the new venture with legitimacy and may act as a form of credible commitment (Williamson 1996) for those transacting with the new venture. Furthermore, VCs can introduce entrepreneurs to key buyers and suppliers and later help them establish ties with high-reputation underwriters (Megginson and Weiss 1991).

Most research attempting to explain the value of VCs to the ventures they back has either been primarily descriptive (MacMillan et al. 1989; Rosenstein 1988; Fried and Hisrich 1995) or has adopted an agency theoretic perspective and therefore tends to illuminate the value of VCs by their mitigation of potential opportunism on the part of entrepreneurs (Amit, Glosten and Muller 1990; Busenitz, Arthurs, Hoskisson, and Johnson 2003; Barry, Muscarella, Peavy, and Vetsuypens 1990). This latter stream of research has often utilized IPO underpricing as the dependent performance variable and emphasizes information asymmetries and capital market perceptions as the reason

behind underpricing (cf. Certo, Covin, Daily and Dalton 2001). On the other hand, the former research has utilized management team member and/or VC perceptions of venture performance (before the IPO) relative to expectations or relative to competitors (Rosenstein, Bruno, Bygrave, and Taylor 1993; Sapienza 1992; MacMillan, Kulow, and Khoylian 1989; Rosenstein 1988). Although these studies have provided insight into what VCs actually do, we still have a very limited understanding of the value that they add.

Finance scholars have found that underwriter reputation is positively associated with long-term (e.g. five-year) stock price performance (Carter, Dark, and Singh 1998) and that the size of the new venture and the year of its IPO (Lerner 1994) are also significantly related to long-term stock performance (Gompers and Lerner 1999). Given VCs' careful selection of ventures (Hall and Hofer 1993; Zacharakis and Meyer 2000) and their association with high-reputation underwriters, we should expect to see better performance in the population of venture-backed firms at the time of IPO (when information asymmetries can be substantial) but these stock price performance effects should disappear over time if the market is relatively efficient. However, if VCs are a key undervalued strategic factor (cf. Barney 1986), they should endue their ventures with the capacity for superior product market performance after the IPO. Unfortunately, our understanding of the value of VCs to the ventures they back during the post IPO period remains clouded at best (cf. Daily et al. 2002).

In summary, prior research argues that the market tends to value venture capitalist-backed new ventures higher at the time of IPO because VCs provide evidence of quality when other information – particularly performance information concerning the

venture – is lacking or incomplete. However, after the IPO, more public information concerning performance vis-à-vis competitors becomes available. Due to lock-up agreements (typically lasting 180 days) that prevent their exit from the venture, VCs cannot sell out at the time of the IPO (Bradley, Jordan, Yi, and Rodten 2001). Since VCs are largely compensated contingent upon the success of the businesses in which they invest (Sahlman 1990; Gompers and Lerner, 1999; Fried, Bruton, and Hisrich, 1998), and given that exit, on average, occurs a year and a half after the IPO (Gompers and Lerner 1998), they have a strong incentive to remain actively involved in the venture.

This research seeks to develop stronger theory for why VCs may add value during the post-IPO period where performance among firms is based more on product market considerations rather than on capital market reputation. Valuing an organization requires the ability to forecast the cash flows of the organization (Bettis 1983). Before the IPO this information concerning potential cash flows of a new venture is very difficult to forecast. As a result, our theories explaining and predicting firm performance (e.g. the amount of underpricing) at the time of the IPO must communicate why information is more easily forecast about certain organizations or why certain organizations will have a better reputation with investors at the time of IPO. On the other hand, after the IPO, our theories must explain why organizations perform better vis-à-vis competitors. In consequence, the resource based view of the firm (RBV), as a theory of firm rents (Mahoney 2001), provides the foundation for explaining this phenomenon (Barney 1986; 1991; Peteraf 1993). This post-IPO period is characterized by the euphoria concerning the recent IPO and the uncertainty of ongoing success and

survival. Resource base weaknesses (West and DeCastro 2001) as well as performance shortfalls must be identified and addressed in order for the new venture to succeed. As such, organizations must demonstrate dynamic capabilities to reconfigure the resource base as needed (Teece, Pisano, and Shuen 1997; Eisenhardt and Martin 2000).

Dynamic capabilities has been defined as the ability to respond in a timely manner to environmental changes by adapting, and reconfiguring the resource base in response to external threats (Teece, et al. 1997). Whereas, the original examination of dynamic capabilities focused on the ability of firms to react to environmental changes in order to maintain their competitive advantage, more recent research has applied it to the context of older firms facing a Schumpeterian shock (cf. Hill and Rothaermel 2003). In this sense, dynamic capabilities are seen as necessary in order for firms to respond to external threats given certain internal rigidities and the associated concomitant weaknesses. In either case, the motivators for changes within the organization are potential or actual threats combined with the identification of current resource base weaknesses in dealing with those threats. Thus, dynamic capabilities implicitly assumes a teleological or strategic choice approach to organizational design and adaptation (Child 1972). Organizations that are able to identify those threats and make the proper response will thus be positioned to perform better compared to organizations with weaker dynamic capabilities. Within the new venture context, dynamic capabilities are particularly applicable owing to the liability of newness of IPO-stage firms. These firms experience many new pressures including increased government scrutiny and regulation, exposure to more competitors, and growing pains associated with the transition from entrepreneurial management to professional management (Jenkinson and Ljungqvist

2002; Certo, et al. 2001). Resource base weaknesses and environmental threats for these firms may prove to be even more detrimental due to their smaller size in general.[2] With this in mind, we seek to develop stronger theory to explain why VC-backed ventures are able to exhibit superior dynamic capabilities and deal with weaknesses and threats in the post-IPO period and we further seek to provide a test of our arguments.

This paper is constructed as follows. First, the resource based view of the firm is discussed as an underpinning for understanding dynamic capabilities and new venture performance (in the post-IPO period) in entrepreneurship research. A model of new venture performance is proffered in which dynamic capabilities are demarcated from entrepreneurial capabilities. Next, we provide insight into how venture-backed firms display greater dynamic capabilities in the post-IPO era and the resulting performance implications. Hypotheses are developed and tested on a matched pair sample of venture capitalist-backed and non venture capitalist-backed new ventures. Afterwards, a post-hoc analysis is utilized to examine the relationship between VC characteristics and new venture performance. Finally, the implications and limitations of the study are discussed along with future research opportunities.

THE RESOURCE BASED VIEW OF THE FIRM IN ENTREPRENEURSHIP

The resource based view (RBV) of the firm, a theory developed primarily in strategic management, has also found substantial relevance within the field of entrepreneurship (Alvarez and Busenitz 2001). According to the RBV, organizations that possess a valuable, rare, inimitable, and nonsubstitutable resource or resources will be endowed to "conceive and implement a value-creating strategy not simultaneously

[2] Not surprisingly, size has been the greatest predictor of longer-term success for firms emerging from bankruptcy (cf. Daily 1996).

being implemented by any current or potential competitors" (Barney 1991: 102). The result is a sustainable competitive advantage if other firms cannot implement a like strategy (Barney 1991).

The use of the RBV in entrepreneurship seems highly appropriate given that both are founded upon the idea of buying low and selling high. That is, they both encompass the idea that the investment in undervalued strategic factors or inputs (Barney 1986; 2001) leads to superior performance. The RBV is an enactment-based theory (Lado and Wilson 1994) that begins (from an entrepreneurship perspective) with the identification of an opportunity in the product market and proceeds with investment in strategic factors that are thought necessary to pursue the opportunity or more broadly, to implement the value-creating strategy. This investment in undervalued strategic factors can be the result of accurate managerial perceptions concerning the future or it can be the result of luck (Barney 1986).

Dynamic Capabilities Distinguished from Entrepreneurial Capabilities

Dynamic capability (or capabilities) has been broadly defined as the ability to reconfigure the firm's resource base (Eisenhardt and Martin 2000). On the other hand, entrepreneurial capabilities can be seen as the ability to identify a new opportunity and develop the resource base needed to pursue the opportunity. Whereas the identification of a new opportunity and the subsequent investments to the resource base are the hallmark of entrepreneurial capabilities, the adjustment and reconfiguration of the resource base in conjunction with an extant opportunity are the hallmark of dynamic capabilities. Both are similar insofar that they represent investments to the organization's resource base. However, entrepreneurial capabilities are primarily linear

with the opportunity positioned as the reference point for decision makers. That is, decision makers identify the opportunity and begin building the resource base that they deduce is necessary for the given opportunity. Dynamic capabilities, on the other hand, are primarily recursive in that they combine knowledge concerning the organization's performance against its aspired level of performance in the product market along with the search for new strategic inputs and recombinations that would permit the organization to meet its performance expectations. Falling short of aspirations is a primary motivator for change (Whetten 1987) that is a feature of dynamic capabilities. As such, the focal point with dynamic capabilities fluctuates among an examination of external influencers of performance in the product market, the target customer base, an examination of the organization's capabilities vis-à-vis any potential competitors for the customer base, and an examination of the strategic factors market for potential undervalued strategic inputs.

The dividing line between the two is more clearly specified when we consider the nature of the opportunity and the nature of the organization. Entrepreneurial capabilities are uniquely associated with completely new opportunities. When the opportunity is new and is presented to a new organization (e.g. one without an established resource base), the organization's decision makers have greater flexibility in building the resource base to equip the organization in the pursuit of the new opportunity. This is similar to the group of entrepreneurs that recognize an opportunity and work together to build a product and develop an organization to pursue the opportunity. If successful, the entrepreneurs will be able to take their company public and reap the rewards of their entrepreneurial capabilities. The more developed

organization with an established resource base is likely to have inherent rigidities (Leonard-Barton 1992) that arise as the result of the aggregation of stocks of capabilities (Dierickx and Cool 1989) in connection with the pursuit of a former opportunity. These rigidities, which are path dependent and occur over time (Nelson and Winter 1982), alter the future search of the organization and impede future entrepreneurial capabilities (Hill and Rothaermel 2003). For example, because knowledge is path dependent and shapes the lens and search patterns in the organization, decision makers' alertness for seeing new entrepreneurial opportunities will narrow in accordance with organizational experience. Furthermore, the range of possibilities that decision makers consider becomes much more limited once the organization has developed an established resource base. Thus, as an entrepreneurial venture advances, the need for dynamic capabilities becomes apparent as organizational adjustments to its resource base and changes in the broader environment come into play. Dynamic capabilities do not replace entrepreneurial capabilities, but rather they serve as a potentially important complement to the earlier foundation.

The following figure details the initial entrepreneurial capabilities presented as the initial opportunity identification and resource base development (e.g. strategic factor investments) and subsequent product market performance. The dynamic capabilities are represented in the feedback loop. The importance being that the feedback loop represents an assessment of the elements in the external environment and internal environment that impact product market performance and how they impact that performance. Furthermore, this loop represents an evaluation of the product market performance versus competitors, an examination of the nature of the opportunity as it is

now becoming clearer, and an evaluation of the resource base that the organization currently possesses versus that which is deduced necessary to meet performance expectations in the future (given the current and potential competitor resource bases in competition for the product market). These multiple evaluations become the basis for making adjustments to the resource base which can include purchasing new strategic inputs as well as reconfiguring the existing resource base.

Insert Figure 1 about here

DYNAMIC CAPABILITIES IN NEW VENTURE PERFORMANCE

To this point our discussion of dynamic capabilities has been rather pedagogical in order to demarcate entrepreneurial capabilities from dynamic capabilities and to properly illuminate the RBV framework underlying each. We now move on to a discussion of dynamic capabilities for the new venture in the post-IPO context and how this differs from the startup stage. Making it to the IPO stage signals the successful application of entrepreneurial capabilities in the startup stage. Because new ventures are founded on ideas for new products with applications to unproven markets, they contain a great deal of uncertainty. Making strategic decisions in a timely manner before a window of opportunity vanishes is only possible in highly uncertain environments by using a more heuristics-based decision style. Without the more extensive use of heuristics in decision making, most new ventures would simply not be launched. Recent research indicates that entrepreneurs use heuristics more extensively than their managerial counterparts in large organizations (Baron 1998; Busenitz and Barney 1997) allowing them to make inferences leading to innovative ideas that can not be derived

from factual-based decision making. Thus, a heuristic-based logic can be a source of competitive advantage for entrepreneurs launching new businesses in highly ambiguous and uncertain markets (Alvarez and Busenitz 2001).

Unfortunately, the entrepreneurial capabilities that are necessary in the early years are rarely sufficient for the longer-term success of a new venture. As a venture matures, several adjustments typically need to occur. Organizationally, systems such as regular financial and performance appraisal, accounting, inventory control, and human resource practices need to be formalized and put in place (Hambrick and Crozier 1985). In the startup phases, most of these issues are handled simply and somewhat extemporaneously, but usually in a sufficient manner. As a part of venture planning process, specific markets are usually targeted to the new product. However, many times the primary targeted market does not respond as anticipated. New markets have to be targeted and sometimes an unexpected market emerges. Consequently, adjustments to a firm's resource base are necessary to accommodate such changes.

The skills and decision style appropriate for the early stages may also become dysfunctional in later stages calling for new adjustments (Busenitz and Barney 1997; Komisar 2001). The post-IPO period represents an era in which the transition from entrepreneurial leadership to professional management requires the application and development of new skills. The founders must either transition away from charismatic leadership to a more bureaucratic leadership in order to properly guide their newly-public firms or bring in new leadership (Suchman 1995). In this situation, greater comprehensiveness in decision making becomes important and a heuristics-based decision style that over generalizes from a limited knowledge base poses a severe threat

for the venture. Unfortunately, many entrepreneurs lack the managerial and decision making skills needed in a burgeoning organization. Furthermore, entrepreneurs previously involved in all aspects of the organization may find it difficult to limit their involvement to the more strategic aspects of top management.

In summary, entrepreneurial ventures and their managers must adjust their resources and capabilities or they will likely find themselves in a downward death spiral. Entrepreneurial ventures must continue to hone and reconfigure their resource base in light of the changing environment. Ideally, entrepreneurs would identify their weaknesses and emerging problems that could lead to competitive disadvantage or even organizational failure. Unfortunately, this can be extremely difficult, and even more so when a particular capability such as decision style is a strength in one stage of the firm but a weakness in another.

Given their past and present involvement in multiple ventures, VCs are likely to have more insights into emerging trends in the general environment and their implications for specific firms. Consistent with this argument, the boards of directors in VC-backed ventures are more experienced and tend to bring about more changes in their ventures particularly in the area of strategy and management team composition (Rosenstein 1988; Gorman and Sahlman 1990; Kunze 1990) and thus they are likely to instill a capacity for ongoing change. Those organizations where the top management team operates rather autonomously with limited involvement from the board are likely to be at a greater risk for poor decision making because of the limited search and evaluation activities (cf. Jensen 1993). In light of the above arguments, VC-backed firms may have a particular advantage in the post-IPO era, particularly since the boards

of VC-backed firms tend to have greater involvement in strategy formation and evaluation (Fried et al. 1998) than non-VC-backed firms. This would also be consistent with research that has found VCs to accelerate a management team's strategic and operational learning (Barney, Busenitz, Fiet, and Moesel 1996; Sapienza 1992). Thus, we expect to see superior strategic decision making and the existence of greater dynamic capabilities in VC-backed ventures. Given the preceding arguments, we propose the following:

> *Central Proposition: Ceteris paribus venture capitalist-backed new ventures will demonstrate greater dynamic capabilities than non venture capitalist-backed new ventures.*

As apart of enduing their organizations with superior decision making as it relates to dynamic capabilities, VCs combine industry experience with important industry ties in order to equip their organizations with superior resource acquisition and recombination skills. The weight of previous research in the area of dynamic capabilities has focused primarily on the reconfiguration of the knowledge base as a necessary precondition in pursuing some sort of technological innovation (cf. Hill and Rothaermel 2003). This assumption naturally tends to paint dynamic capabilities as technology-based and involving human capital. Those with more experience in bringing a new venture to and through the IPO have a base of knowledge to better understand the influencers on the product's performance in the market. As such, venture capitalists, as specialists in certain industries, combine a superior knowledge base (Grant 1996) with industry-specific ties that allow for the development and deployment of dynamic capabilities. This experience provides insight into the needed internal resource base changes. Established ties with others in the industry provide access to important

exogenous resources needed in the reconfiguration of the resource base. As such, VCs provide access to these resources by providing the new venture contact to resource providers that would not have otherwise been available, as well as the necessary legitimacy to assuage these resource providers' concerns about potential opportunism or unreliability on the part of the new venture (Stuart, Hoang, and Hybels 1999). For example, VCs may have greater success in convincing senior managers with substantial industry experience to join the new venture if their particular skills are needed going forward. Furthermore, VCs may provide ties to potential alliance partners that would make available any additional knowledge needed to develop the new venture's products. In sum, dynamic capabilities relate to the ability to identify the need to change and the ability to successfully effect a change when a particular weakness or threat is observed. In this case, we hypothesize that VC-backed ventures will be more successful in effecting this change.

> *Hypothesis 1A: VC-backed ventures will demonstrate greater dynamic capabilities compared to non-VC-backed new ventures as evidenced by superior market performance after a product weakness is identified.*

> *Hypothesis 1B: VC-backed ventures will demonstrate greater dynamic capabilities compared to non-VC-backed new ventures as evidenced by superior market performance after a management weakness is identified.*

We believe that dynamic capabilities are primarily concerned with assessing the environment (both external and internal), and taking actions to adjust the resource base in order to attain superior future performance. Decision makers must identify those elements in the external environment that impact the firm's performance and must decide whether and how the resource base should be adjusted given the firm's current capabilities and the competitive environment. To focus merely on the product and

management of the new venture renders this picture of dynamic capabilities incomplete given the nature of potential influencers on product market performance. For example, institutional elements like new government regulation can motivate the development of dynamic capabilities. Organizations that seek entry into new markets like China and Vietnam must develop competencies in dealing with business groups and government agencies. Similarly, the previously private new venture must develop new competencies as it goes public and begins to deal with increasing government regulation, legal liability, SEC guidelines, and other issues that become more pronounced with increased visibility. With this in mind, we do not limit the scope of the hypotheses to merely an examination of dynamic capabilities as they relate to product development.

For firms recently experiencing an IPO, the legal and government regulatory environment becomes more salient as a consequence of being publicly traded and as more and more products and services are developed, sold and dispersed to more and more customers. Many ventures compete in new industries with radically new technology that is awaiting government evaluation and sanction. For example, biotech firms and firms involved in genetic research await clear government policy concerning development and the potential applications of the technology. Given the increasing liability of directors in public companies over the last twenty years (Kaplan and Harrison 1993), those on the board have a vital interest in not only understanding the issues at hand but in actively seeking ways to equip the organization with the ability to deal with potential legal and regulatory threats. As such, it would seem that VCs would provide added benefits to the ventures they back owing to their industry specialization and their experience in bringing several new ventures to and through an IPO.

Hypothesis 1C: VC-backed new ventures will demonstrate greater dynamic capabilities compared to non-VC-backed new ventures as evidenced by superior market performance after a legal liability threat is identified.

Hypothesis 1D: VC-backed new ventures will demonstrate greater dynamic capabilities compared to non-VC-backed new ventures as evidenced by superior market performance after a government regulation threat is identified.

METHODOLOGY

One of the problems in dynamic capabilities research (indeed in all RBV-based research) is the issue of unobservables (Godfrey and Hill 1995). Without access to the thoughts and actions of decision makers, researchers cannot properly test for dynamic capabilities. For example, if researchers were to utilize R&D spending or capital investment as a proxy for the dynamic capabilities of the organization and then examine some performance variable such as return on assets (ROA), then any significant results would be problematic due to potential issues surrounding the justification for the expenditure. Without knowing the reason for the R&D expenditure or capital investment, or the timing of cash flows, the internal validity of the study would be questionable. For example, let's assume that an organization has a competitive advantage based on its distribution and logistics competence. If it were to invest a sizeable amount of money in upgrading a key distribution facility, then its ROA would likely decline for a period of time due to the initial investment and the delay in higher cash flows. Researchers conducting a large-sample regression analysis on ROA would improperly observe this firm as a poor performer in the dataset. On the other hand, organizations that do not make key investments to their resource base will realize

potentially superior short-term performance even though they are becoming less competitive over the long-term.

In order to control for this issue of unobservables, we have utilized management discussion of risk factors in the prospectus of each new venture in the sample. Every firm going through an IPO must file a prospectus with the Securities and Exchange Commission (SEC) prior to the actual IPO. IPO prospectus statements disclose information on the ownership, management compensation, monitoring structures, director profiles, and risk factors along with other information important to potential investors, regulators, and other interested parties. The risk factors detail specific weaknesses or threats to the organization that must be addressed in order for the organization to succeed. Their listing provides a window to allow us insight into the organization's dynamic capabilities. That is, some organizations must demonstrate dynamic capabilities in the area of product development or in dealing with government regulations affecting the organization, whereas others may have to demonstrate dynamic capabilities as they relate to the development of management. Those organizations that are more successful at addressing the weaknesses and reacting to threats attain superior performance. Thus, the risk factors signal areas of the organization where dynamic capabilities are needed and they also provide insight into areas of the organization that will retain management's focus going forward. In this study, regression is used to predict the ventures' one-year stock price return adjusted for risk and market effects (Sharpe's measure) because the market should incorporate information concerning how each firm is reacting to previously identified risk factors.

Sample

To test the hypotheses, a matched-pair sample of VC-backed and non-VC-backed ventures that had gone through an initial public offering (IPO) between 1990 and 1994 was created. Given that IPO markets experience major fluctuations and assuming that there is no such thing as a "typical" IPO year (Beatty and Zajac 1994), the time frame selected spans multiple years while also omitting extremely low or high volume years. Seven hundred and sixty nine firms in technology-based industries that went through an IPO in the U.S. market during this timeframe were identified through the *New Issues* database produced by Thomson Financial. Venture-capitalist backed and non venture-capitalist backed firms were matched based on the year of the IPO and the three-digit Standard Industry Classification (SIC) code. A total of 422 firms (211 matched pairs) comprised the sample. Missing data reduced sample size to 268 (134 matched pairs).

Measures

Dependent variables. The one-year Sharpe's measure (Sharpe 1966), (e.g. the one year risk-adjusted stock price returns controlling for market effects) was used as the dependent variable in this study. Sharpe's measure is calculated by taking the one-year returns and subtracting the risk-free rate during this time period (e.g. the return on t-bills) and then dividing this value by the standard deviation in the stock price returns over that year. The one-year returns as well as the standard deviation of returns were obtained from the CRSP data tapes. Sharpe's measure is particularly useful in this context because it inherently controls for the opportunity cost of the decisions made by

the organization and further assists us in dealing with the issue of unobservables on the part of the researcher.

Independent variables. The independent variables in this study were categorical variables coded 1 if the venture exhibited the variable or 0 otherwise. As stated previously, the risk factors for the given venture were identified and classified. The variables include: 1) Product-related risk factor, 2) Management-related risk factor, 3) legal liability-related risk factor, and 4) government regulation-related risk factor. A chi-square test of differences between the VC-backed and non-VC backed ventures revealed no significant differences. The product-related risk factor was coded 1 if the organization specified that it had a small product line or if the products in its product line were limited and needing greater development. The management-related risk factor was coded 1 if the organization specified that its management was inexperienced. The legal liability-related risk factor was coded 1 if the organization recognized that it was important to remain abreast of legal liability issues for future success. Finally, the government regulation-related risk factor was coded 1 if the organization recognized that government regulation would represent a concern for future success. In addition to these variables, VC-backing was coded 1 if the venture had a VC on the board of directors and venture capital funding. In order to separate out the effects of VCs on these risk factors, we coded interaction terms for VCs with each of the risk factors using a methodology prescribed by Hardy (1993).

Control variables. Six control variables were used in the study. Prior research has found that firm size can impact firm performance. Therefore, the log of total assets was included as a control variable. The age of the organization at the time of the IPO

was utilized as a control variable as well. Furthermore, the amount of underpricing was utilized as a control variable in order to control for market efficiency. That is, if the market is efficient, it should properly price the stock of each new venture after the IPO. Lastly, we wanted to control for the amount of R&D intensity as well as new product intensity of the respective firms and included one plus the R&D expenditure divided by employees (total logged) and one plus the number of new products divided by total employees (total logged) as measures for these controls.[3] These two controls will help to control for firms that are naturally more aggressive in technology expenditure and new product develop versus those that are (importantly) more successful at such activities (as reflected in the Sharpe's measure.

Statistical Methods

Three models were specified in the analysis; the first one includes just the control variables. The second one includes all of the main effects whereas the third one includes the interactions to separate out the effects of venture capitalists. The second model testing the main effects is:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + E$$

Where:
X_1 = log of total assets, X_2 = age of the firm, X_3 = IPO underpricing, X_4 = R&D intensity, X_5 = new product intensity, X_6 = VC backing, X_7 = product-related risk factor, X_8 = management-related risk factor, X_9 = legal liability related risk factor, X_{10} = government regulation-related risk factor.

The third model specifically tests the hypotheses by separating out the effects of VCs with interaction terms (Hardy 1993). The result is an additive model which provides the additional effect of having VC-backing in addition to the given risk factor. We input the

[3] We examined these variables without logging them and got similar results.

interactions sequentially in order to display the change in R^2 associated with each interaction term. This model is:

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_6X_7 + B_{12}X_6X_8 + B_{13}X_6X_9 + B_{14}X_6X_{10} + E$$

Where:
X_1 = log of total assets, X_2 = age of the firm, X_3 = IPO underpricing, X_4 = R&D intensity, X_5 = new product intensity, X_6 = VC backing, X_7 = product-related risk factor, X_8 = management-related risk factor, X_9 = legal liability related risk factor, X_{10} = government regulation-related risk factor, X_6X_7 = the interaction of VC backing with product-related risk factor, X_6X_8 = the interaction of VC backing with management-related risk factor, X_6X_9 = the interaction of VC backing with legal liability-related risk factor, and X_6X_{10} = the interaction of VC backing with government regulation-related risk factor.

RESULTS

Table 1 provides the means, standard deviations, and correlations among all variables in the study.

Insert Table 1 about here

Hypothesis 1A proposed that ventures with VC backing would exhibit greater dynamic capabilities in the area of product risk. Interestingly, the coefficient examining the product related risk factor is positive and significant in the second model testing main effects. However, in the third model, this coefficient is nonsignificant when controlling for all other independent variables (cf. Hardy 1993) including VC-related interaction terms. When we examine the interaction between VC backing and product-related risk factor, this coefficient is positive and significant (p<.05). As a result, support for Hypothesis 1A is strong. It appears that the market perceives that venture

capitalist-backed ventures are better able to address product-related weaknesses and threats.

Hypothesis 1B proposed that VC-backed ventures would demonstrate greater dynamic capabilities in the area of management-related risk. In the second model, examining just the main effects, this coefficient is positive and significant ($p<.001$). In the third model, this coefficient is positive but not significant. However, when we examine the coefficient for the interaction between VC-backing and management-related risk factor in the third model, the coefficient is positive and significant ($p<.01$). Thus, for the VC-backed ventures, a management-related risk factor is associated with higher performance at the one year mark. Apparently, the market perceives that boards with VCs are able to hire and or develop and motivate the necessary managerial talent for the new venture to succeed.

Hypothesis 1C proposed that VC-backed ventures would demonstrate greater dynamic capabilities in the area of legal liability-related risk. In the second model, testing main effects, this coefficient was negative and marginally significant ($p<.10$). On the other hand, this variable was not significant in model three. The interaction term examining VC-backing and legal-liability related risk factor was also not significant. Thus, hypothesis 1C is not supported.

Hypothesis 1D proposed that VC-backed ventures would demonstrate greater dynamic capabilities in the area of government regulation-related risk. In the second model, this coefficient examining the main effects is negative but not significant. In the third model, this coefficient is also negative but not significant. Furthermore, the coefficient for the interaction term in the third model examining the effects of VC-

backing and government regulation-related risk factor is also not significant. Thus, hypothesis 1D is not supported.

Insert Table 2 about here

Post-Hoc Analysis

At this point, our results indicate that the market values VC-backed ventures higher vis-à-vis non-VC-backed ventures when the organization is facing either product-related risks or management inexperience. In our theory development, we argued that VCs will assist venture teams in making better resource base decisions and will impute legitimacy to the organization and allow it to obtain resources from the marketplace that would otherwise be unavailable. However, this earlier analysis treated VC involvement as a unified class. Given that VC firms as a class do appear to add dynamic capabilities to the ventures in which they invest, we where interested in further probing whether there was variance among VCs in their abilities to enhance venture performance. Consequently, we pursued a post-hoc analysis involving those ventures that had VC-backing and that had specified either a product-related risk factor and/or a management-related risk factor at the time of their IPO. This resulted in a sample of 62 firms. We coded the following five variables and used them (in addition to the four control variables) to predict one-year Sharpe's stock price performance:

1) VC Firm Years of Experience - VC experience (total years) in the venture capital industry
2) VC Firm Industry Experience - VC experience (total years) in the industry of the new venture
3) Individual VC Experience - average tenure of the VC on the board of directors
4) The number of boards on which the venture capitalist serves

5) Venture capitalist reputation

The first three variables provide measures of different types of VC experience and their impact on venture performance. That is, we would expect those VC firms with greater experience to provide superior counsel on average compared to those with less experience. We further expect those VCs with greater industry experience to provide similarly superior counsel. Average tenure of the VC indicates the average length of time that VCs have been on the board of the new venture. In this case, we expect a longer tenure to provide additional benefits to the organization because the VCs will be more familiar with the nuances of the given competitive situation facing the organization. The last two measures represent signals of the venture capitalists' reputation. We expect that the number of boards on which the VCs serve should provide a measure of how well respected they are in general. The second measure is the venture capitalists' reputation.[4] We expect that each of the five measures will be positively related to the new ventures' performance on the dependent variable.

The results from this post-hoc analysis are quite interesting and provide a modicum of support for our earlier arguments. For example, the experience as a venture capitalist is both positive and significantly ($p<.05$) related to post-IPO performance. On the other hand, although the coefficients for each are both positive, neither industry experience nor the average tenure of the VCs is significant Given the significance of

[4] We utilized the underwriter reputation scale created by Carter and Manaster (1990) and created an average reputation for the venture capitalists based on the reputation of the underwriters with whom they were associated. For example, if a venture capitalist was associated with three different underwriters with reputation scores of 7, 8, and 9 during the five year period of our sample, then the venture capitalist's reputation would be an average of 8. We then dummy coded those venture capitalists with a reputation score of 8 or higher with a "1" and coded those with less than an 8 reputation score as a "0" in order to capture a measure of their prominence.

the venture capital experience, it is perhaps not surprising that industry experience is not significant. We suspect the earlier industry experience likely has grown stale given that the industries we examine are high-tech. We also find that VC reputation is positive and significantly ($p<.05$) related to post-IPO performance. Combined with VC experience, this provides evidence that certain VCs in particular bring to their ventures capabilities that are rare and valuable. Interestingly, the number of boards on which the VCs serve is significant and negatively ($p<.05$) related to one year performance. Apparently, serving on too many boards has a negative implication and signals the spreading of oneself too thin. It would therefore make sense that a VC could provide much less support to a new venture if he or she were spending a sizeable amount of time on other boards. In hindsight, we believe that this is consistent and supportive of the other findings and makes our case even stronger in that VCs provide value through their involvement and not merely through the attachment of their name (especially if it is apparent that their attention will be divided among a number of firms).

DISCUSSION

Previous research has provided insight into the value of VCs leading up to the IPO. This research has bifurcated into one stream of research examining why information is more easily forecast for VC-backed new ventures, and another stream of research examining perceptions of VC value added. Whereas the former stream of research informs our understanding of why VC-backed new ventures generally suffer less underpricing at the time of IPO, the latter stream of research informs our understanding of what VCs actually do to help the new venture. In particular, the VC value added research has generally focused on the mentoring and advising roles of VCs

and how they assist entrepreneurs in gaining knowledge and making wise strategic decisions. Unfortunately, however, this stream of research has relied on perceptual measures of value and has not provided evidence of how these ventures are made more competitive.

In this study, we have drawn from the VC value added literature to tie the value of VCs to their assistance in building dynamic capabilities. Whereas entrepreneurial capabilities are primarily linear, dynamic capabilities are recursive and require experienced decision making that VCs provide through their oversight on the board of directors. These dynamic capabilities take on even greater importance due to the increased visibility and competitor contact that going public allows. Thus, whereas entrepreneurial capabilities are vitally important in the pre-IPO period, dynamic capabilities take on greater significance after the IPO. As a result, we have sought to clearly demarcate these capabilities and to provide a theoretical basis for understanding them within the context of the resource based view of the firm.

Importantly, we find that VCs do act as a catalyst and endue their organizations with dynamic capabilities as they relate to product and management development. This is not necessarily unexpected because prior research has specified that VCs are experts in certain fields and develop specialized capabilities that others cannot easily copy. As a result, it makes sense that VCs should provide an advantage in areas where the dynamic capabilities are unique to a specific industry. That is, by specializing in a certain industry or few industries, VCs become experts at judging managerial talent and at helping to develop products. On the other hand, in areas where the dynamic capabilities

are more generic (e.g. in the area of legal liability and government regulation), VCs apparently provide no greater value.

The results in this study are particularly interesting because they not only provide evidence of VC value beyond the capital provided, but they also provide a finer-grained view of dynamic capabilities. Whereas it makes sense that dynamic capabilities as they relate to product and management development would be important for a new venture, perhaps dynamic capabilities in the area of legal liability and government regulation would be more important for established corporations. Furthermore, it would be interesting to examine dynamic capabilities development in the area of bankruptcy and reorganization. A question therefore remains whether dynamic capabilities diminish in value based on the industry life cycle or whether they take on different characteristics. It would seem that dynamic capabilities would be much less needed in slow-cycle industries where competition is based on size and economies of scale rather than on the ability to innovate.

The results in this study are particularly important to entrepreneurship research, and also call for future research. A natural assumption of this study is that management will focus on those risk factors identified and that the market will observe the actions of the organization. Unfortunately, we do not have access to the actual decision making dynamics within each of the organizations to observe why VCs act as the catalyst for dynamic capabilities. Furthermore, we do not have knowledge about what each organization actually did to address the risk factors. Although the stock price provides the best performance measure to incorporate this information, future research could specifically query top managers on what they do to address these risk factors and

whether the decision making process changes accordingly. In lieu of this information, we observed that VC experience and VC reputation were both significant and positively related to a venture's performance whereas the number of boards was negative and significant.

We recognize that the risk factors in the prospectus do not provide any insight into gradation of the risk being faced. There is no way to judge the magnitude of the risk from one company to another. Therefore, our results are rather coarse-grained. Researchers with access to survey data would provide greater insight into the magnitude of these risks. Furthermore, we do not test whether different combinations of risk factors are detrimental to the organization. Although a test of the difference in the total number of risk factors proved non-significant, combinations of certain risk factors may have an impact on performance. Lastly, we have coded the risk factors based on their clear specification in the prospectuses. We have assumed that these measures are reliable insofar that they are required by the SEC; their omission would provide potential ammunition for lawsuits by investors.

CONCLUSION

This research has probed the potential value that VCs may add beyond the capital they provide. In particular, we developed theory to show the importance of dynamic capabilities in the post-IPO period and how VCs act as a catalyst in bringing about dynamic capabilities in the area of product and management development. Because they cannot exit their investment from the new venture for quite some time after the IPO, they have an incentive to remain actively involved in overseeing the top management team. As experts who specialize in certain industries, VCs provide superior advice and

learning assistance that non-VC-backed ventures lack. On the other hand, it was found that VCs provide no greater value in bringing about dynamic capabilities in the more generic areas of legal liability and government regulation.

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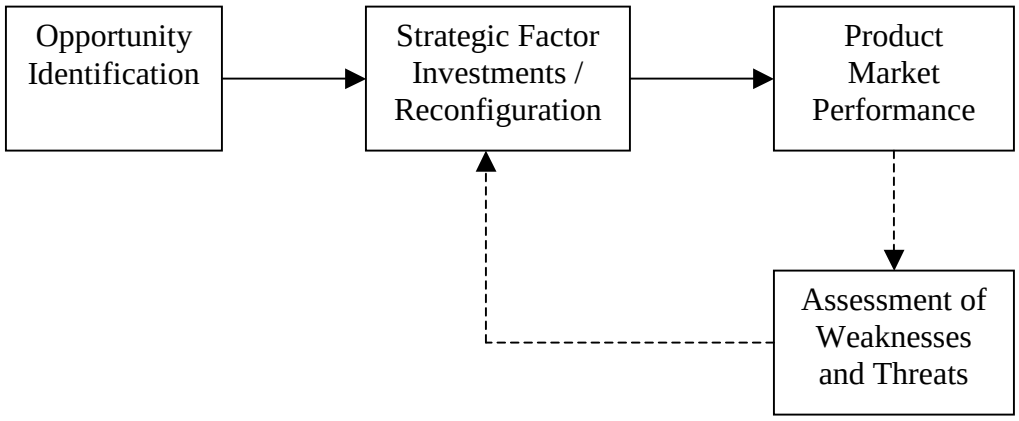
Figure 1

Entrepreneurial Capabilities (linear) versus Dynamic Capabilities (recursive – demonstrated by the dotted lines).



Dynamic capabilities in an organization are evidenced in the feedback loop assessing how well its resource base is aligned to attain the desired performance vis-à-vis competitors as well as the adjustments to the resource base arising as the result of the assessment.

TABLE 1

Means, Standard Deviations and Correlations

	Mean	Std.	Sharpes	Firm Size	Firm Age	Underpricing	R&D Intensity	NP Intensity	VC Backing	Prod RF
Sharpes	.08	.23	1.00							
Firm Size	6.9	.67	21**	1.00						
Firm Age	9.0	7.4	.10	.23**	1.00					
Underpricing	.10	.25	.21**	.06	.02	1.00				
R&D Intensity	3.64	1.59	.20	-.21**	-.14*	.08	1.00			
NP Intensity	.40	.51	-.14*	-.27**	.03	-.05	.05	1.00		
VC Backing[1]	.50	.50	.10	.10	-.04	.12	.41**	-.09	1.00	
Prod RF[1,2]	.39	.49	.05	-.31**	-.23**	.10	.19**	-.14*	.04	1.00
Mgt RF[1,2]	.13	.34	.19**	-.09	-.04	.08	.15*	-.05	.04	.18**
Legal Liab RF[1,2]	.28	.45	-.14*	-.13*	-.11	.02	.17**	.10	-.03	.09
Gov Reg RF[1,2]	.54	.50	-.12*	.00	-.13*	-.06	.07	.01	-.05	.02
VCxPRF[1]	.21	.41	.19**	-.07	-.07	.20**	.33**	-.15*	.51**	.63**
VCxMRF[1]	.07	.26	.27**	.06	.02	.18**	.16**	-.11	.28**	.18**
VCxLLRF[1]	.13	.34	-.05	-.06	-.08	.08	.34**	-.02	.39**	.09
VCxGRRF[1]	.26	.44	-.03	-.01	-.10	-.03	.33**	-.06	.59**	.07

[1] Spearman Rank correlations are reported where ordinal data is used.
[2] Chi-square test reveals no significant difference between the total number of VC-backed and non-VC-backed with this risk factor in the dataset.
[3] Test of the difference in total number of risk factors between VC-backed versus non-VC-backed was not significant.

TABLE 1 (Continued)

Means, Standard Deviations and Correlations

	Mgt RF	Legal Liab RF	Gov Reg RF	VCxPRF	VCxMRF	VCxLLRF	VCxGRRF
Sharpes							
Firm Size							
Firm Age							
Underpricing							
R&D Intensity							
NP Intensity							
VC Backing							
Prod RF[1,2]							
Mgt RF[1,2]	1.00						
Legal Liab RF[1,2]	-.03	1.00					
Gov Reg RF	.01	.48**	1.00				
VCxPRF[1]	.18**	.05	.03	1.00			
VCxMRF[1]	.72**	-.02	.01	.35**	1.00		
VCxLLRF[1]	.01	.63**	.28**	.29**	.10	1.00	
VCxGRRF[1]	.04	.24**	.55**	.36**	.19**	.57**	1.00

[1] Spearman Rank correlations are reported where ordinal data is used.
[2] Chi-square test reveals no significant difference between the total number of VC-backed and non-VC-backed with this risk factor in the dataset.
[3] Test of the difference in total number of risk factors between VC-backed versus non-VC-backed was not significant.

TABLE 2

Results of the Linear Regression Estimating the Relationship Between Risk Factors, VC Backing, and One-Year Stock Performance

DV: 1-yr Sharpe's Return	**Controls**	**Main Effects**	**VCxPRF**	**VCxMRF**	**VCxLRF**	**VCxGRF**
Controls						
Log of Total Assets	.175*	.227**	.211**	.174**	.166*	.166*
Age of Firm	0.061	0.072	0.062	0.059	0.065	0.065
IPO Underpricing	.188**	.160**	.144*	.129*	.136*	.135*
R&D Intensity	.052	.008	.011	.009	.016	.016
NP Intensity	-.079	-.024	-.020	-.016	-.024	-.024
Independent Variables						
VC backing		0.058	-0.054	-0.100	-0.044	-0.039
Product-related risk factor		.121†	-0.025	-0.024	-0.036	-0.036
Mgmt-related risk factor		.244***	.231***	0.035	0.039	0.038
Legal liab-related risk factor		-.117†	-.118†	-.123†	-0.020	-0.024
Gov reg-related risk factor		-0.041	-0.050	-0.049	-0.052	-0.046
VC x Product risk factor			.235*	.198*	.214*	.214*
VC x Mgmt risk factor				.278**	.270**	.271**
VC x Legal liab risk factor					-.157†	-0.152
VC x Gov reg risk factor						-0.011
R^2	0.094	0.194	0.213	0.243	0.253	0.253
Adjusted R^2	0.076	0.162	0.179	0.207	0.214	0.211
Model F-Statistic	5.346***	6.117***	6.230***	6.727***	6.538***	6.048***
Change in R^2	0.094	0.101	0.019	0.029	0.010	0.000
F-Statistic for Change	5.346***	6.337***	6.127*	9.808**	3.479†	0.09

N = 268 (134 matched pairs). *** p<.001, ** p<.01, * p<.05, † p<.10.

UNDERWRITERS AND THE AGENCY PROBLEM AT THE TIME OF THE IPO: WHEN IS UNDERPRICING MORE LIKELY AND WHEN IS IT LESS LIKELY?

ABSTRACT

When a new venture goes through an IPO, it usually works with an underwriter to navigate the going-public process. Unfortunately, the underwriter and the issuing firm often have conflicting goals concerning the pricing of the firm's stock. Underwriters have an incentive to price the stock low, or "underprice," in order to please their institutional investors. Underpricing is the difference between the first-day closing price minus the offering price of the stock divided by the offering price and it represents money "left on the table." On the other hand, the issuing firm has an incentive to avoid underpricing. Using agency theory, we develop theory to explain when underpricing will be more likely and when it will be less likely. We test our hypotheses on a sample of firms going public in the 1990s and discuss the implications of our findings.

INTRODUCTION

Entrepreneurship as a field of study generally focuses on the pursuit of new opportunities and the activities of firms engaged in bringing new ideas to financial fruition. Due to their liability of newness, growth and survival are never a certainty for new ventures; indeed, organizational failure is much more common. Those new ventures that do attain a modicum of success often seek to "go public" through an initial public offering (IPO) of their stock in order to raise additional capital. The IPO process entails more than just the listing of a firm's stock on a stock exchange. The new venture will generally utilize an investment banker to underwrite the shares and help guide the new venture through the going-public process. Thus, underwriters act as an agent of the issuing new venture. Within this paper, investment bankers and underwriters are used synonymously.

Owing to the newness of the ventures involved in an IPO, properly pricing the stock before its offering on an exchange is not easy. Investment bankers in the U.S. engage in book building activities with their institutional investors in order to ascertain the demand for shares of the new venture (Jenkinson and Ljungqvist, 2002). This book building process is preceded by a "road-show" by the entrepreneurs staged with the assistance of the investment banking firm. During the road-show, entrepreneurs present information (contained in a preliminary prospectus) about their company to the institutional investors. After the road show, institutional investors specify to the investment banker the number of shares they would be willing to purchase based on the price of those shares. That is, the volume demanded is specified based on the range of prices originally announced by the investment banker. The end result is the creation of a

demand curve representing the shares demanded based on the price of those shares of stock. Interestingly, when demand outpaces the supply of shares available, the investment banker has complete discretion over the allocation of shares among institutional investors (Jenkinson and Ljungqvist, 2002; Aggarwal, Prabhala, and Puri, 2002). On the day of the offering, institutional investors will be allocated their shares at the final offer price (decided the day before the IPO) and any additional shares available in the offering will be sold to the public on an exchange. It should be noted that the final offer price is ultimately negotiated between the new venture and its board of directors and the underwriter.

Most IPOs in the U.S. suffer from significant underpricing (Rock, 1986; Jenkinson and Ljungqvist, 2002). Underpricing is generally defined as the difference in the first-day closing price minus the offer price minus divided by the offer price (Daily, Certo, Dalton, and Roengpitya, 2003). This underpricing represents money "left on the table" that the new venture forgoes and, as such, is detrimental for the new venture. A new venture's liquidity is particularly important owing to its liability of newness (cf. Singh, Tucker, and House, 1986). Given the importance of wealth retention for ongoing organizational success, strategic management scholars are becoming more interested in examining the issues surrounding underpricing. For example, Certo, Covin, Daily, and Dalton (2001), examine how the existence of a founder interacts with the composition of the board of directors to either promote or reduce underpricing. They find that new ventures with founder CEOs experience more underpricing in general, and less relative underpricing when the board is dominated by insiders instead of outsiders (when the founder is the CEO). Similarly, on a UK sample of firms, Filatotchev and Bishop

(2002) examine how executive characteristics affected the composition of the board for new ventures going through the IPO. They observed significantly less underpricing in their sample of firms among those where more than a third of the directors on the board were nonexecutives.

Whereas management scholars are now taking greater interest in the issues surrounding underpricing and wealth retention for new ventures, finance scholars, have developed several theories (extensively discussed in Rock, 1986; and Jenkinson and Ljungqvist, 2002) to explain the existence of underpricing. Although there has been substantial academic research into this phenomenon since the 1980s, certain changes including increasing market power among underwriters as well as increasing underpricing over the last decade have provided new opportunities for further research. Indeed, extraordinary first-day gains especially during the Internet bubble as well as the extraordinary investor losses during the Internet bubble crash have prompted the mainstream press to examine the "cause" of these gross market imperfections. Much of this inquiry has focused on the potentially unethical activities of underwriters. For example, underwriters have been accused of giving venture capitalists buy-in to "hot" IPOs as a quid pro quo for future business (Smith, Grimes, Zuckerman, and Scannell, 2002). The implication is that underwriters and venture capitalists may act in concert (at the expense of the new ventures going through the IPO). Similarly, underwriters have been accused of taking advantage of the firms that they underwrite in order to increase their own profits (Surowiecki, 2002; White, 2004). Additionally, underwriters have been targeted for intentionally "hyping" shares of firms to retail investors that they knew were over-priced. Indeed, in an article in *The Economist* bemoaning the loss of investor

confidence in the stock market as the result of investment banker malfeasance, the authors write:

> "How much punishment does Wall Street deserve, and what reforms does it need? At the most basic level, financial markets stand accused of knowingly selling over-priced shares by claiming they were cheap, and of doing so in ways that benefited some of their customers (and themselves) to the detriment of others. In particular, this boils down to three main concerns. One is about the role of the research that is published by investment banks; a second is about the way in which shares in IPOs are allocated; and the third is about the use of accounting rules to mislead investors" (Economist Staff, 2002).

Unfortunately for the new venture, the underwriter often has a strong incentive to seek greater underpricing in order to please their institutional investors with whom they may transact several times. Thus, the development of a goal conflict between the underwriter and the new venture is a potentially natural outcome at the IPO. Given the principal-agent relationship arising between the two as well as potentially differing goals, it would seem that agency theory could more thoroughly inform our understanding of this relationship. Although the principal-agent model of underpricing was first proposed by Baron and Holmstrom (1980) and Baron (1982), it has not received much attention in academia since Muscarella and Vetsuypens (1989) provided a partial test rejecting its usefulness. In their study of thirty-eight investment banks, they found that these investment banks underwriting their own IPOs also underpriced significantly. The assumption was that if the principal-agent model were valid, investment bankers would not intentionally underprice their own shares. Yet the results of this study are not without controversy. The limited sample size (e.g. thirty-eight investment banks) as well as the age of the sample (e.g. pre-1990) limits the generalizability of the results. Indeed, Alli, Yau, and Yung (1994) found that IPOs of

financial institutions (whose managers should know better the proper value of their stock) suffered from substantially less underpricing compared to non-financial institutions. Furthermore, given the changes in the market for IPOs during the 1990s as well as the increasing market power of underwriters, the principal-agent model remains a viable explanation for underpricing and demands further examination according to Jenkinson and Ljungvqist (2002). Lastly, we would add three additional points. First, the desire by underwriters to please their institutional investors (for their investment in future IPOs) may very well invalidate the arguments of Muscarella and Vetsuypens. That is, underwriters may be willing to endure underpricing of their own stock in order to develop customer loyalty among a group of institutional investors. Second, we would argue that the results of Muscarella and Vetsuypens (1989) do not invalidate the principal-agent model as it relates to the underwriter and the new venture. The principal-agent model in agency theory merely requires a separation of ownership and control as well as potentially differing goals between the agent and the principal as well as information asymmetry. Because each of these requirements is met when an investment banker underwrites the shares of a new venture, agency theory seems particularly suited for explaining the incidence or likelihood of underpricing.

With this in mind, we seek to probe the relationship between the new venture and underwriter to identify what motivates underpricing and when it will be more likely given the potential effectiveness of mechanisms used to avoid the agency problem. In the remainder of the paper, we discuss the potential goal conflict arising between the underwriter and the new venture and how agency theory informs our understanding of the outcomes of this conflict. We develop hypotheses to explain when underpricing will

be more likely and when it will be less likely and then test our hypotheses with a sample of new ventures going through the IPO in the 1990s. We then discuss the implications of our results and discuss potential future trends given our results.

AGENCY THEORY WITHIN THE IPO CONTEXT

The central premise behind agency theory is the assumption that an agent can take advantage of a principal when there is a separation of ownership and control (Jensen and Meckling, 1976). In the IPO context, the new venture's board of directors represents principals who employ the investment bankers who are agents. As the result of information asymmetries, investment bankers can engage in actions that would increase their wealth at the expense of the new venture. In particular, investment bankers can intentionally underprice an offering in order to please their institutional investors and attract them for future offerings. It would seem that underwriters would prefer less underpricing since their remuneration comes primarily in the form of an underwriting fee based on the offer price as their compensation (Chen and Ritter, 2000). Yet underwriters have conflicting interests in that they must please their institutional investors in order to secure investors for future deals. Those institutional investors willing to reveal greater demand information in the book building process and who tend to hold on to their shares of stock for longer periods after the IPO (to maintain the stability of the share price) are particularly valuable to underwriters (Beneviste and Spindt, 1989). Since these institutional investors benefit from underpricing (e.g. buying low and later selling much higher), underwriters have an incentive to underprice in order to continue attracting their business. Indeed, moderate to high levels of underpricing are associated with higher stock value among underwriters and overpricing is associated

with lower stock value and lower market share among underwriters (Nanda and Yun, 1997; Dunbar 2000). Furthermore, Aggarwal et al. (2002) found that institutional investors enjoy higher returns in IPO investments than retail investors and are allocated both greater share volume in those IPOs that exhibit high levels of underpricing and lower share volume in those IPOs that are poorer performing. Thus, it would seem that underwriters manage the pricing and allocation of IPO shares in order to please their institutional customers sometimes at the expense of the new venture. Interestingly, it appears as though underwriters tend to increase the level of underpricing when the supply of IPOs is expected to increase in the near future. For example, Ibbotson, Ritter, and Sindelar (1994) found that higher IPO underpricing precedes higher volumes of IPOs in the U.S. Similarly, Lowry and Schwert (2002) find autocorrelation among IPO returns and volume. Thus, it would appear that this higher underpricing may act as an enticement to keep institutional investors loyal to a particular investment banker.

When the investment bank underwrites the shares of the new venture, it makes money through its underwriting fees. Underwriters also typically have an over-allotment option to purchase additional shares of stock at the initial offer price (less underwriting fees) after the offering. This over-allotment option period typically lasts 30 days after the offering and allows the underwriter to stabilize the stock price. Jenkinson and Ljungqvist (2002) discuss the purpose of this over-allotment option and write, "essentially, the investment banking syndicate stands prepared to buy shares in the after-market in the event of pressure for the share price to fall (in particular below the issue price) and to sell more shares (either at the time of the IPO or in the after-market) in the event of high levels of excess demand for the shares" (Jenkinson and Ljungqvist,

2002: 21). Thus, the underwriter has an interest in underpricing and seeing the stock appreciate in value both because this appreciation in value pleases the institutional investors and may allow the underwriter to profit through the gross spread on the shares. On the other hand, any price drop can be particularly troubling. Thus, underwriters are often quite active in aftermarket trading (Ellis, Michaely, and O'Hara, 2000).

A central premise of this paper is that underwriters on average have greater knowledge about the demand for the stock and can price the new shares to suit their needs sometimes at the expense of the new venture. Furthermore, the need for analyst coverage and marketing by the underwriter (after the end of the 25-day "quiet period" following the initial offering) has given underwriters greater power vis-à-vis the new ventures they underwrite since 1990 (Loughran and Ritter, 2003). The evidence and arguments presented would tend to imply that underwriters should always seek to significantly underprice and that they can do so rather indiscriminately. Yet there are pressures against underpricing in certain situations. Agency theory helps us to understand both when underpricing will be more likely and less likely.

Our examination into the underpricing phenomenon through an agency theoretic lens focuses our attention in three particular areas. First, agency theory presumes that goal alignment between the principal and agent is the ideal and that this goal alignment will result in behaviors on the part of the agent that promote the interests of the principal. As such, agency theory has provided certain mechanisms to aid in aligning interests (cf. Williamson, 1988). Second, agency theory argues that information asymmetry is necessary for an agency problem to arise and that greater information on the part of the principal can reduce the severity of the agency problem (Eisenhardt,

1989). Lastly, agency theory examines situations wherein the agent engages in co-opting activities in order to diffuse attention and reduce the vigilance against his or her self-seeking activities (cf. Kosnik, 1990). We believe that these three elements are particularly salient within the IPO context and examine them in the following sections.

Monitoring the Actions of Underwriters – Motivation and Ability

Agency theory has provided certain prescriptions for ameliorating an agency problem before it occurs (Eisenhardt, 1989; Jensen and Meckling 1976). Three mechanisms in particular will mitigate the likelihood of an agency problem. Even though these three involve costs they are intended to prevent the agency problem a priori (Williamson, 1988). First, the principal can monitor the behavior of the agent; second, the principal can provide incentives to align the interests of the agent with the principal; and last, the agent can be bonded to the organization (Eisenhardt 1989; Williamson 1988). In the IPO context, the new venture is at a disadvantage in that two of the mechanisms are ineffectual or may be too costly to implement. In most cases, the new venture will issue new shares only once and thus may only employ the underwriter once. As a result, the relationship between the two takes on the nature of a one-round game where incentives to the underwriter are much less useful considering the high importance that underwriters place on pleasing institutional investors (with whom the underwriters will interact multiple times). Most underwriting agreements in the U.S. are now "firm commitment" (Jenkinson and Ljungqvist, 2002) meaning that the underwriter promises to sell (or else purchase) a certain number of shares at the time of the IPO. This firm commitment is a bonding activity that induces the underwriter to expend marketing and selling effort to ensure that there is sufficient demand for the shares of

stock. Any bonding of the underwriter associated with the stock price may end up being counterproductive in that it may preclude the selling of sufficient shares to the public. Thus, both incentives and bonding appear to be much less useful in this context.

The third mechanism, monitoring, relates to the involvement of the principal in overseeing the actions of the agent (Walsh and Seward, 1990). This monitoring can take many forms but is predicated on the motivation and ability of the principal. Naturally, those with a greater stake in the decision will engage in greater monitoring. Conversely, those with less ownership may tend to free-ride off those with greater ownership (Hoskisson and Turk, 1990). In the IPO context, we believe that insiders on the board of directors will have a stronger incentive and ability to act as monitors of the underwriter for three reasons. First, insiders on the board of directors will have participated in the road show and will have attained first-hand knowledge of the reception given by the institutional investors. Second, the insiders as employees (and owners) of the new venture desire less underpricing because this represents wealth that they personally forgo (according to the number of shares they sell in the offering). Furthermore, underpricing means that the venture receives less money and forgoes the benefit of greater liquidity. Due to their liability of newness, new ventures with weak liquidity are at greater risk for bankruptcy and a loss of employment for those insiders. Therefore, insiders will want less underpricing in order to aid the new venture and preserve their employment. Lastly, insiders will have greater ability to engage in monitoring activities due to the fact that they interact with the underwriter more often than outside directors would. Insiders are likely to have a greater understanding of the sources and implications of uncertainty facing the organization (Zahra, 1996) which tend to be much higher in this context. This

understanding is particularly precious in the context of valuing the new venture. With this in mind, we believe that boards with greater insider representation will act to provide stronger monitoring. Consequently, those boards with higher levels of insider motivation and ability to monitor will likely suffer less underpricing.

H1a: There will be a negative relationship between the amount of insider equity in the new venture and the amount of underpricing.

H1b: There will be a negative relationship between the insider ratio and the amount of underpricing.

Principal Experience and Level of Information Asymmetry

A cornerstone of agency theory is the assumption of information asymmetry between the principal and agent. If the principal were completely informed, the agent could not engage in acts of opportunism through deceit or guile (Williamson, 1985). We believe that a venture with a more-experienced board of directors will have greater insight and knowledge into the relative value of its stock and will not be captive to the pricing decisions of the underwriter. That is, the board's experience will result in less information asymmetry and ignorance which should reduce the underwriter's ability to pursue greater underpricing. Yet experience on the board is often a rarity for new ventures especially since they tend to have small boards. Indeed, it is not uncommon for new ventures to add new, independent outside members to the board just prior to the IPO in order to fulfill SEC requirements for publicly traded corporations (cf. Kesner, 1988). Given the importance of experience in reducing information asymmetry, we argue that new ventures with boards of directors with greater experience will suffer less underpricing. Again, we focus here on the experience of insiders due to their increased

motivation to avoid underpricing and because insiders are privy to more strategic information that outsiders lack (Zahra, 1996; Baysinger and Hoskisson, 1990).

The experience of the board encompasses several different elements including industry work experience, the number of industry firms worked for, and the number of other boards they are on. Each of these provides a measure of experience that would potentially act to reduce the information asymmetry concerning the value of the new venture vis-à-vis that which is proposed by the underwriter. As such, we examine each of these in the context of underpricing.

Industry experience may be particularly important for reducing the inherent information asymmetry of board members concerning the value of the new venture because this experience provides multiple reference points for greater comparisons. Furthermore, those insiders with greater experience will have witnessed the results associated with different strategies and will understand better the value associated with any strategy (Certo et al. 2001). Because industry experience allows for a better understanding of competitors, this knowledge provides a basis to understand the likelihood for future growth for the new venture. This experience also aids the new venture in understanding customers better and provides insight into potential brand loyalties that could translate into a first-mover advantage for the new venture (cf. Lieberman and Montgomery, 1988). Thus, we argue that those new ventures with greater industry experience among insiders on the board will have a better understanding of the value of the venture and will be able to resist underwriter attempts to underprice the stock of the new venture.

H2a: There will be a negative relationship between the amount of industry experience among inside board members and the amount of underpricing.

H2b: There will be a negative relationship between the number of industry firms for which insiders on the board have worked and the amount of underpricing.

The last element of experience we examine is the number of other boards on which the inside board members serve. In this case, we believe board experience will be of even greater importance because multiple board memberships can provide more recent information concerning multiple organizations. Furthermore, those board members (serving with the insiders on the other boards) may provide a sounding board and counsel to the insiders whose venture is preparing for the IPO. Finally, those insiders serving on other boards may have already observed the going-public process and will better understand the nuances of the process. With this in mind, we believe that those new ventures with insiders maintaining additional directorships will be better equipped to understand the value of the new venture and will provide greater protection against underwriter efforts to underprice the stock.

H2c: There will be a negative relationship between the number of other boards on which inside board members sit and the amount of underpricing.

Co-opting the New Venture

To this point in the paper we have provided arguments for why certain characteristics of the new venture's board of directors should result in less underpricing. We now examine elements of the offering which would act to co-opt the new venture and reduce its vigilance in negotiating against underpricing. Acts of co-optation are intended to reduce or neutralize resistance by a particular individual or group by getting them to overlook or even endorse the position of the co-opter. For example, a group or individual engaging in co-optation may seek to assimilate or absorb others who might

oppose the group (Pfeffer, 1972). Alternatively, those engaging in co-optation may act to please others in order to assuage their concerns or make them beholden to the group or individual (Fredrickson, Hambrick, and Baumrin, 1988; Child and Rodrigues, 2003). The agency problem arises when an agent co-opts a principal as a means to engage in guileful self-interest seeking. For example, a CEO can seek to reduce the board's vigilance in monitoring by seeking to populate the board with insiders or related outsiders beholden to the CEO (Frederickson et al., 1988). This reduction in board vigilance allows the CEO to more easily engage in acts of opportunism at the expense of shareholders. Often this co-optation allows the individual or group to exert power over another group with decision-making authority in order to get that group to act in the interests of those wielding the power (Shleifer and Vishny, 1986; Rosenstein and Rush, 1990). For example, Rosenstein and Rush (1990) found that companies conducting a partial acquisition of another company may seek to co-opt the target firm managers through an implied threat of a complete takeover. After co-opting these managers, the firm making the partial acquisition then seeks what the authors call "intercorporate perquisites" that come at the expense of other shareholders. Within the IPO setting, the underwriter may be able to co-opt the new venture and its board of directors and reduce their vigilance against underwriter attempts to underprice the stock.

There are two elements – the costs to the venture going through the IPO and the revenues resulting from the IPO - which can be used by the underwriter to co-opt the new venture into accepting (or ignoring) higher undepricing. Whereas underpricing represents an indirect cost to the new venture, the underwriter's fee (based on a percentage of the offer price) represents a direct cost to the new venture. An underwriter

wanting to lessen the new venture's vigilance against the underwriter's attempts to underprice may reduce a visible and tangible cost in exchange for one that occurs only after the offering. In this case, the underwriter may reduce its underwriting fees as a means to co-opt the board of directors and assuage their concerns about underpricing. A board that was able to negotiate for lower underwriting fees would likely feel as though it were successful in its dealings with the underwriter. On the other hand, an underwriter would likely gladly accede to a reduction in underwriting fees if this allowed for greater underpricing much like a used car salesman would reduce the down payment due on a car in exchange for a longer loan period or higher payments. Thus, we suspect that underwriters will reduce their underwriting fees as a means to increase the underpicing.

H3a: There will be a negative relationship between the underwriter's fee (discount) and the amount of underpricing.

Whereas reduced underwriting fees could be used to co-opt the new venture, increased cash flows could also do the same. One of the primary goals of going public is raising cash. When the amount of cash raised in the IPO is very high, concerns about underpricing would likely diminish (Loughran and Ritter, 2002). That is, new ventures previously constrained by a paucity of resources and cash may feel as though they've won the lottery at the time of the IPO. As a result, the costs (owing to the higher underpricing) vis-à-vis the increase in wealth would seem negligible. Thus, the underwriter may be able to take advantage of a venture by pursuing higher underpricing when this increase in wealth from the IPO is very high. We believe there are certain elements of the offering which can provide tangible evidence of this massive increase in wealth for the new venture. In particular, we believe that the new venture will be less

vigilant to avoid underpricing when the total dollars from the offering is very high. Similarly, we believe that the new venture will be less vigilant to avoid underpricing when the amount of dilution for new investors (those that invest at the time of the offering) is very high. The company's prospectus details the book value of shares for current investors and specifies the amount over the book value that new investors will have to pay. When this amount is very high, the original investors will see their wealth increase compared to those that buy in at the time of the IPO.

H3b: There will be a positive relationship between the size of the offering (in total dollars) and the amount of underpricing.

H3c: There will be a positive relationship between the amount of dilution for new investors and the amount of underpricing.

Performance Issues and Underpricing

We have discussed characteristics of the board as well as characteristics of the offering that would encourage or discourage underpricing. We now examine one final situation wherein the underwriter and the new venture will seek to avoid substantial underpricing. Agency theory informs us that where there is goal alignment, the agent will act in a way that is beneficial to the principal (Eisenhardt, 1989). Our examination into underpricing allows us to more fully test the assumptions of agency theory and assess outcomes when goal conflict arises and when goal alignment occurs. The following situation will tend to align goals between the issuing firm and the underwriter which should result in less underpricing.

Whereas many organizations that go public do so in order to raise capital, they have an incentive to make the organization "shine" in order to generate greater demand for the shares (Teoh, Wong, and Rao, 1993). DeGeorge and Zeckhauser (1993) find a

similar phenomenon among organizations that go through a reverse LBO. This activity may include "cleaning up the balance sheet" and "massaging the income statement" up to the limits allowed by generally accepted accounting principles (GAAP) (Jenkinson and Ljungqvist, 2002). Those organizations that are reasonably well-positioned for ongoing performance may benefit from this activity by inciting greater investor interest in the new venture and so underpricing for these organizations is more likely. However, in the situation where an organization is in severe need of the capital raised from the offering in order to maintain operations or when the organization is facing severe competitive threats, underpricing represents wealth depletion that could be the difference between survival and failure after the IPO. The failure of a new venture shortly after an IPO would likely besmirch the underwriter's reputation (for similar logic concerning the underwriter's motivation for the new venture to perform well, see Nanda, Yi, and Yun, 1995). Thus, we believe that when a new venture demonstrates an urgent need for as much capital as possible from the offering, underpricing will be less severe. In this situation both the underwriter and the new venture will have closer goal alignment. It is important to note that the underwriter will still make money in this situation. Furthermore, the underwriter can control which institutional investors receive shares and the number of shares they receive in the offering. Thus, less important institutional investors may receive higher allocations in these types of IPOs. The following section details when underpricing is likely to be less severe due to the organization's need for capital given its performance and competitive situation.

When an organization is preparing for the IPO and the prospectus is being created, the new venture is required to provide audited financial statements. The

auditing firm conducting the audit provides a written, signed statement indicating whether the financial statements accurately represent the financial condition of the firm according to GAAP. In addition to this statement, the auditing firm is required to indicate whether it believes that the new venture is a going concern (e.g. whether it is viable in the near future). This statement (detailing concerns about the organization's ability to remain a going concern) would indicate that the auditor has serious doubts about the organization's ability to meet its financial responsibilities in the future and therefore indicates an organization with severe liquidity issues. An organization that has going concern issues will need as much cash from the offering as possible in order to survive and so we believe these new ventures will suffer less underpricing.

H4a: There will be a negative relationship between the existence of going concern issues (as specified by the auditing firm) and the amount of underpricing.

In the prospectus, the new venture's management provides a discussion of the organization's performance to date and further provides a statement concerning the liquidity of the organization. After the initial cash paid in by the entrepreneurs and others like business angels is expended, it is not uncommon for a new venture to seek debt financing especially if the venture appears promising. Additionally, it is not uncommon for a venture to expend this money on R&D in order to pursue new technology or develop new products. For an established company with sufficient sales generated from existing products this is not problematic. However, for the highly-leveraged new venture, too much debt can pose a serious risk of failure. In this situation, the IPO represents a means to pay down much of this debt and so we believe that the amount of debt compared to revenues provides a measure of how needy a new

venture is for the cash generated from the IPO. When this ratio is higher, underwriters will have less incentive to pursue substantial underpricing.

H4b: There will be a negative relationship between the debt/revenues ratio (as specified in the balance sheet of the prospectus) and the amount of underpricing.

The final element which we examine is the competitive situation facing the new venture. Within the prospectus, the organization's management provides a discussion of the risks to the investor. Organizations that are facing significant competition must detail this as one of those risks. The newness of IPO firms is not necessarily problematic if they are able to find a niche which has been relatively underserved by larger competitors. However, the liability of newness for new ventures is compounded when they face larger, well-established rivals. In this situation, a lack of cash resources would likely increase the mortality rate among these IPO firms. Consequently, greater competition provides an incentive for the new venture to remain vigilant in guarding against higher underpricing owing to the importance of greater liquidity.

H4c: There will be a negative relationship between the identification of significant competition as a risk to the new venture (in the prospectus) and the amount of underpricing.

METHODS

Sample

To test the hypotheses, a sample of ventures that had gone through an initial public offering (IPO) between 1990 and 1994 was created. Given that IPO markets experience major fluctuations and assuming that there is no such thing as a "typical" IPO year (Beatty and Zajac 1994), the time frame selected spans multiple years while also omitting extremely low or high volume years. Our sampling frame was comprised

of 422 firms in technology-based industries that went through an IPO in the U.S. market during this timeframe as identified through the *New Issues* database produced by Thomson Financial. The prospectuses of each firm provided the information in this study for all independent variables. Firms with fewer than 10 employees were eliminated in order to reduce the number of marginal firms in the sample. Missing data within the prospectuses as well as firms going through a seasoned equity offering (SEO) improperly identified as IPOs as well as those going through an LBO were further eliminated thereby reduced the sample size to 313 firms.

Measures

Dependent variables. The dependent variable used in this study is the one-day trading period returns. This variable is calculated as the first-day closing price minus the offer price divided by the offer price (Daily et al. 2003). The offer price was obtained from the final prospectus and the first-day closing price was obtained from the CRSP data tapes. A positive return represents underpricing by the underwriter and indicates value that was not appropriated by the new venture. Thus, a positive return on the first trading day represents an unfavorable outcome for the new venture.

Independent variables. The independent variables in this study were obtained from the prospectus of each venture. There are four classes of independent variables relating to the four groups of hypotheses. The first group of independent variables includes the percentage of equity owned by insiders on the board of directors and the insider ratio on the board of directors. The percentage of equity owned was calculated as the total amount of equity owned by insiders divided by the total equity of the new venture. Higher ownership by insiders provides a measure of their relative power. The

insider ratio is the number of firm officers serving as board members divided by the total number of board members (Johnson, Hoskisson, and Hitt, 1993). The higher the amount of insiders the greater the likelihood that strategic information is used in assessing the performance and value of the venture (Baysinger and Hoskisson, 1990) and this ratio also represents a measure of power in this context in that it represents a greater unified voice when facing the underwriter.

The second group of independent variables provides a measure of experience and increased information and includes the inside directors' total years in the industry, the number of industry firms for which inside directors have worked, and the number of other boards on which inside directors serve. The total number of industry firms for which inside directors have worked is merely the sum of the total number of industry firms for each insider as noted in the prospectus. Likewise, the total amount of industry experience is the sum of each insider's number of years of experience in the industry of the new venture. Whereas the membership of inside directors on other boards is often interpreted as a symbol of prestige (cf. D'Aveni, 1990), we believe in this case that it represents a source for greater information for the inside directors.

The third group of independent variables includes the underwriter discount percentage, the total dollars provided the new venture from the offering, and the amount of dilution for new investors. The underwriter discount percentage is the underwriter's percentage charge per dollar per share of stock sold in the offering and represents a direct, tangible cost to the new venture (Chen and Ritter, 2000). The total dollars provided the new venture in the offering is listed in the prospectus and is calculated as the total number of new shares issued times the offer price (less underwriter discounts)

of the shares. Lastly, the amount of dilution is also clearly listed in the prospectus and is the difference in price between the stock's offer price at the IPO minus the book value of the original shareholders.

The final group of independent variables provides a measure of the neediness of the new venture for the cash generated from the offering. This includes a dummy variable identifying whether or not a venture was at risk as a going concern according to the auditing firm and a dummy variable identifying the risk factor related to significant competition facing the new venture. The last variable, the debt to revenue ratio, is calculated as the total debt of the new venture in the year prior to IPO divided by the total revenues in the year prior to the IPO. This variable provides a measure of leverage and indicates how easily the organization can meet its debt payments through its current activity.

Control variables. Eight control variables were used in this study. The log of total assets (cf. Bloom & Milkovich, 1998) was used as a control for the size of the organization. The age of the organization was further coded to control for the maturity of the organization. In addition to this, the year of the IPO as well as the 2-digit SIC code were both controlled with dummy variables. Given the importance of insiders on the board of directors in the hypotheses, we controlled for their average age because age may affect their investment horizon – e.g. those closer to retirement age may become more cautious in their behavior which could affect how strongly they negotiated with the underwriter. We also controlled for their average tenure on the board. Those with a longer tenure with the new venture may have a greater psychological attachment to the organization that might affect their decision making (cf. Pierce, Kostova, and Dirks,

2001) as well. The reputation of the underwriter was obtained from the Carter and Manaster (1990) and the Carter, Dark, and Singh (1998) scales for underwriter reputation. Jay Ritter has updated this scale on his personal website at the University of Florida. Any missing underwriters from the Carter et al. (1998) scale were cross-referenced with Ritter's information. Lastly, a dummy variable was used to control for venture capital backing.

RESULTS

Table 1 provides the mean, standard deviation, and correlations among all variables.

Insert Table 1 about here

We utilized hierarchical regression to test our hypotheses and calculated five models beginning with the control variables. Each of the four groups of variables was then entered in blocks. To test for the presence of multicollinearity, we examined the variance inflation factors and found none approaching the commonly accepted threshold of 10 (Neter, Wasserman, and Kutner, 1985). This suggests that multicollinearity was not a problem.

Hypothesis 1a proposed that there would be a negative relationship between the amount of equity owned by insiders on the board of directors and the amount of underpricing. The coefficient for this variable is nonsignificant. Thus, the amount of insider equity appears to have little impact on the amount of underpricing. Hypothesis 1b proposed that there would be a negative relationship between the insider ratio and the amount of underpricing. The coefficient for this variable is negative and significant ($p <$

.05). Thus, it would appear that higher levels of insiders on the board would allow for greater vigilance in avoiding underpricing by the underwriter.

Hypothesis 2 examined variables which would proxy for experience on the part of the new venture's board of directors and proposed a negative relationship between the amount of experience and the amount of underpricing. It was argued that this experience inherently reduces the information asymmetry and ignorance of the board and reduces the likelihood that the underwriter can underprice indiscriminately. Interestingly, neither insider industry experience (hypothesis 2a) nor the number of industry firms worked for (hypothesis 2b) was significant. However, those insiders with access to other boards have additional sources for information that would aid in avoiding underpricing when dealing with the underwriter. The coefficient for the number of other directorships for insiders was negative and significant ($p < .05$) in the final model thereby supporting hypothesis 2c.

Hypothesis 3 examined variables which could act to co-opt the new venture's decision makers. Hypothesis 3a proposed that underwriters would reduce their underwriting fee as a way to allow for an increase underpricing. It was argued that this reduction in one fee (underwriting) would offset the new venture's concerns about the cost implicit in underpricing. The coefficient for this variable was positive but nonsignificant. Hypothesis 3b proposed that the there would be a positive relationship between the offering size (e.g. the total dollars going to the company from the offering) and the amount of underpricing. It was argued that the new venture would be less concerned with the underpricing when the change in wealth was higher. The coefficient for this variable is not significant. Lastly, hypothesis 3d proposed that there would be a

positive relationship between the amount of dilution for new investors and the amount of underpricing. It was argued that the new venture's owners would observe the higher increase in their stock value and would consequently be less vigilant to avoid underpricing. The coefficient for this variable is positive and significant ($p < .001$). Thus, it appears that underwriters are able to increase the amount of underpricing when the new venture observes a great increase in its wealth at the expense of new investors.

Hypothesis 4 argued that there would likely be less underpricing for organizations that had an urgent need for as much cash as possible from the offering due to the competitive situation and prior performance. In this situation, underwriters would avoid underpricing the stock because a diminished supply of cash could reduce the ventures' chances for survival (and failure would harm an underwriter's reputation). Similarly, the new venture's decision makers would likely remain vigilant to avoid underpricing in this situation as well. Hypothesis 4a proposed that there would be a negative relationship with an auditor's statement questioning the new venture's ability to remain a going concern and the amount of underpricing. The coefficient for this variable is negative and marginally significant ($p < .10$). Hypothesis 4b proposed that there would be a negative relationship between the debt to revenue ratio and the amount of underpricing. The coefficient for this variable is negative and significant ($p < .05$). Organizations that are highly leveraged need as much cash as possible and so these organizations tend to suffer less underpricing. Lastly, hypothesis 4c proposed that there would be a negative relationship between the identification of significant competition for the new venture and the amount of underpricing. The coefficient for this variable is

negative and significant ($p < .05$). Thus, it appears that increased competition for the new venture induces greater vigilance on the part of the board to avoid underpricing.

Insert Table 2 about here

DISCUSSION AND CONCLUSION

Underpricing remains an interesting puzzle for researchers investigating the initial public offering. Although there has been substantial research into this phenomenon since the 1980s, certain changes including increasing market power among larger underwriters as well as increasing underpricing in the last decade have provided new opportunities for further research. This paper develops theory to address when underpricing will be more likely. We believe that agency theory is particularly suited for explaining this relationship because of the clear separation of ownership and control and the clearly conflicting goals between the underwriter and the issuing firm.

Our results provide at least partial support for each of the hypotheses and affirms the value of agency theory in explaining outcomes at the time of the IPO. We find the amount of underpricing is less when insiders dominate the board of directors and when the insiders serve on a greater number of other boards themselves. These results would tend to provide evidence that insiders with greater experience and with greater control over the board are able to mitigate attempts by the underwriter to underprice. Importantly, we confirm a key assumption of agency theory in that those principals suffering less information asymmetry are better equipped to avoid the agency problem.

We believe that our fourth hypothesis is particularly interesting. This hypothesis is focused on what happens when there is goal alignment between the principal and the

agent. In this situation agency theory informs us that underpricing should be less severe. However, the variables represented provide evidence of greater uncertainty concerning the new ventures and this should result in greater underpricing. Bettis notes that "information affects the market price (of a security) by influencing investor forecasts of future cash flows. The more information that is available, the better investors are able to forecast (1983: 410). In this situation, underwriters should have greater difficulty in accurately pricing those securities with performance issues. Conversely, those ventures that do not have performance problems and are not in severe need of the cash from the offering should be much easier to price. However, underwriters tend to be much more accurate in pricing the securities of ventures that are highly leveraged and in dire need of the cash from the offering in order to remain viable. Given these results, the principal agent model seems particularly efficacious.

We believe that a great opportunity exists to corroborate our results with surveys of the board members of new ventures going through the IPO. We suspect that the amount of underpricing may be affected by the nature of the relationship between the board of the issuing firm and the underwriting firm. Since the going-public process is oftentimes a new event for board members of the new venture, their perceptions of procedural justice in their dealings with the underwriter are likely very important. Boards that feel manipulated by the underwriter or unfairly treated will likely resist underwriter attempts to underprice the stock. On the other hand, boards that perceive fair treatment and high procedural justice in their dealings with the underwriter may drop their guard. Thus, the underwriter's communication strategy with the new venture's board of directors may have a great impact on the outcome of the IPO. Any

survey results could be used to test the interaction between board characteristics and the perceptions of procedural justice.

Lastly, it should be mentioned that our sample covers a fairly robust economic period which just precedes the Internet bubble and concomitant explosion in IPOs. These years witnessed a strong supply of IPOs. Thus, our results would cohere with the assumption that underpricing should increase prior to an expected increase in the number of IPO deals because underwriters will seek to establish loyalty (for future deals) among their institutional clients. It would be interesting to observe these results on a newer sample of firms beginning in 2001. Given the decline in IPOs since 2000, we should expect to see less severe underpricing if our assumptions are correct because the underwriters will have less power vis-à-vis the new ventures (which are supplying the IPOs). That is, a contraction in the supply of IPOs will create greater competition among underwriters which will force them to reduce their underpricing to secure deals.

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Table 1: Means, Standard Deviations, and Correlations among All Variables

	Mean	Std Dev	L tot assets	Firm age	VC back	Und rep	Avg ins ten	Avg ins age	Ins eq	Ins ratio
L tot assets	6.91	.644	1.00							
Firm age	8.92	7.32	.208**	1.00						
VC back	.530	.500	.109	-.060	1.00					
Und rep	5.81	2.54	.660**	.119*	.302**	1.00				
Avg ins ten	5.54	4.59	.349**	.315**	.039	.241**	1.00			
Avg ins age	46.18	8.58	.173**	.152**	.061	.021	.239**	1.00		
Ins eq	32.91	31.03	-.074	.199**	-.349**	-.119	.207**	-.110*	1.00	
Ins ratio	.407	.218	-.084	.081	-.340**	-.107	.029	-.182**	.612**	1.00
Tot yr ind	27.01	20.23	.089	.134*	-.143*	-.017	.118*	.220**	.300**	.441**
Tot ind firms	5.15	3.63	-.072	-.040	-.085	-.049	-.139*	.032	.246**	.452**
Ins other bds	.977	1.66	.097	.065	-.068	.000	-.036	.108	-.041	.026
urdisc%	.083	.082	-.110	-.073	-.282**	-.250**	-.100	-.044	.030	.039
Tot $ to co	20,444,335	34,029,595	.503**	-.018	.193**	.341**	.143*	.125*	-.058	.037
Dilution	6.86	3.90	.577**	.072	.235**	.597**	.173**	.086	-.113*	-.127*
Going Concern	.102	.303	-.377**	-.188**	-.126*	-.332**	-.113*	.020	-.023	-.009
Debt / Rev	1.83	13.03	-.053	-.065	-.024	-.053	-.003	.068	.017	.088
Cmptn	.971	.167	-.047	-.050	-.047	.001	-.008	.003	.059	-.009
Undprc	.104	.250	.085	.010	.134*	.277**	.002	-.112*	-.056	-.156**

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Spearman rank correlations are reported where ordinal data are used.

Table 1 (Continued): Means, Standard Deviations, and Correlations among All Variables

	Tot yr ind	Tot ind firms	Ins other bds	urdisc%	Tot $ to co	Dilution	Going Concern	Debt / Rev	Cmptn	Undprc
L tot assets										
Firm age										
VC back										
Und rep										
Avg ins ten										
Avg ins age										
Ins eq										
Ins ratio										
Tot yr ind	1.00									
Tot ind firms	.595**	1.00								
Ins other bds	.177**	.170**	1.00							
urdisc%	.076	.018	-.031	1.00						
Tot $ to co	.039	-.021	.154**	-.094	1.00					
Dilution	.005	-.100	.071	-.126*	.554**	1.00				
Going Concern	-.073	-.042	-.001	.328**	-.224**	-.262**	1.00			
Debt / Rev	.048	.082	-.053	-.008	.166**	-.014	.058	1.00		
Cmptn	-.024	-.012	-.009	-.007	-.023	.113*	-.005	.121*	1.00	
Undprc	-.119*	-.076	-.159*	-.034	.044	.318**	-.119*	-.131*	-.040	1.00

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Spearman rank correlations are reported where ordinal data are used.

TABLE 2

Results of the Linear Regression Estimating the Relationship between Independent Variables and Underpricing

Dependent variable: First-day trading period returns	**Model 1: Controls**	**Model 2: Insider ability to monitor**	**Model 3: Information asymmetry**	**Model 4: Co-opting the venture**	**Model 5: Performance issues**
Controls[1]					
Log total assets	-.14	-.14	-.12	-.20*	-.27**
Age of firm	.02	.02	.03	.05	.03
VC backing	.09	.07	.06	.05	.01
Underwriter reputation	.36***	.37***	.36***	.24*	.23*
Avg. I. tenure	-.02	-.04	-.03	-.01	.01
Avg. I. age	-.12†	-.14*	-.14*	-.13*	-.11†
Ind. Variables					
Insider equity		.11	.10	.09	.06
Insider ratio		-.21**	-.24**	-.21*	-.20*
Industry exp.			.01	-.03	-.03
# of ind. firms			.08	.11	.11
# of other bds			-.11†	-.12*	-.14*
Underwriter discount %				.03	-.01
Total dollars				-.06	-.03
Dilution of new investors				.33***	.34***
Going concern					-.11†
Debt/revenue ratio					-.12*
Comp. risk					-.15*
R^2	.158	.182	.194	.245	.283
Adjusted R^2	.097	.116	.119	.165	.198
F-Statistic	2.60***	2.77***	2.60***	3.08***	3.32***
Δ R^2	.158	.024	.012	.051	.038
F-Statistic for Change	2.60***	3.84*	1.32	5.77**	4.45**

N = 313 *** p<.001, ** p<.01, * p<.05, † p<.10

[1] Controls for year of IPO and SIC code are omitted from table for purposes of space.

SIGNALING IN NEW VENTURES: THE USE AND IMPACT OF THE LOCKUP PERIOD

ABSTRACT

The lockup period is an agreement by the current owners of a new venture to not sell or dispose of their shares without the approval of the investment banker underwriting the shares of the initial public offering (IPO). We investigated the lockup period of a sample of 313 new ventures going through the IPO and find that a longer lockup period acts as an alternative signal to VC and prestigious underwriter backing. Furthermore, we find that ventures which have a going concern issue can reduce the amount of underpricing at the time of the IPO by enduring a longer lockup period.

INTRODUCTION

The initial public offering (IPO) of firms is typically surrounded by significant information asymmetry. As part of the going-public process, new ventures enlist the help of an investment banker to underwrite their shares and assist in marketing the shares to institutional investors. Accurately pricing the shares before the offering has been problematic. Indeed, IPOs traditionally suffer from significant underpricing reflecting inefficiency and information asymmetry in the market (Jenkinson and Ljungqvist, 2002). Underpricing is typically calculated as the difference between the first day closing price minus the offer price divided by the offer price and it represents "money left on the table" and valuable capital that the new venture foregoes (Daily, Certo, Dalton, and Roengpitya, 2003).

Underpricing in and of itself is not surprising owing to the great information asymmetry and uncertainty associated with new issues. Indeed, Bettis (1983) points out the importance that information plays in the pricing of securities. He writes, "Information affects the market price by influencing investor forecasts of future cash flows. The more information that is available, the better investors are able to forecast. Because investors are risk averse, they will pay a premium for the uncertainty reduction that increased information brings" (Bettis, 1983: 410). On the other hand, higher uncertainty surrounding a new venture requires a discount for investors. Within the IPO context, there is hypothesized a positive relationship between the amount of ex ante uncertainty concerning a new venture and the amount of effort needed to market the shares (by the underwriter) as well as the amount of underpricing at the time of the IPO (Grinblatt, and Hwang, 1989; Welch, 1989).

Researchers have proposed that signaling can act to reduce the information asymmetry and reduce investors' uncertainty (Leland and Pyle, 1977; Welch, 1989; Grinblatt and Hwang, 1989; Deeds, DeCarolis, and Coombs, 1997; Certo, 2003) concerning the value of a new venture. To this end, scientific capabilities, venture capital backing, and prestigious underwriter backing have all been identified as empirical signals of quality in the IPO setting. We are interested here in probing the lockup period to see whether and how it is used as a signal. The lockup agreement is an agreement between current shareholders and the underwriter that prohibits current shareholders from selling any of their shares of stock for a period of time after the IPO without the underwriter's approval. Whereas the typical lockup period is for 180 days (Bradley, Jordan, Yi, and Roten, 2001), insiders often agree to longer periods of time. According to Field and Hanka (2001), lockups communicate to investors that key employees will remain with the firm for a period of time and further communicate that insiders are not seeking to cash out in advance of imminent bad news. Prior research on lockups has focused on the returns and trading activity surrounding the lockup expiration. For example, finance scholars have found that venture capital (VC) backed stocks typically suffer a significant abnormal return around the expiration of the lockup period (Bradley et al., 2001; Field and Hanka, 2001) as well as a spike in trading activity (Garfinkle, Malkiel, and Bontas, 2002). However, this same abnormal return is not evident among non-venture capitalist backed stocks. On the other hand, both types of ventures suffer negative abnormal returns around an underwriter's early release from the lockup with even worse returns for venture capitalist backed stocks (Keasler, 2001).

Whereas this previous research into the lockup period has focused on the returns surrounding the expiration of the lockup period, we seek to answer the following four research questions:

1) Does the lockup period complement previous signals used in entrepreneurship research?

2) What is the relationship between the length of the lockup period and other signals of firm quality?

3) Does higher uncertainty surrounding a new venture induce a longer lockup period?

4) Does the use off a longer lockup period by those ventures suffering higher uncertainty reduce this uncertainty for potential investors?

Because the lockup period has not been examined in light of the other types of signals used in previous entrepreneurship research, our inquiry here is rather exploratory insofar that we are interested in identifying whether the lockup period is a distinct signal from previously identified signals, whether it is used primarily by those ventures suffering higher uncertainty, and whether its use impacts the level of underpricing at the time of the IPO.

This paper is constructed as follows. In the following section we discuss the theory behind signaling as a means to overcome adverse selection. We develop hypotheses concerning the use of the lockup period as a substitute signal and then examine its effect on IPO underpricing. We test our hypotheses on a sample of firms going through an IPO between 1990-1994. Finally, we discuss the implications of our results and discuss potential future research.

SIGNALING AND ADVERSE SELECTION

In order to reduce investors' uncertainty concerning new ventures, a prospectus detailing past performance and future prospects is generated by all firms going through the IPO. Whereas the prospectus is intended to provide sufficient information to allow an investor to make an informed decision concerning whether and how much to invest in the new venture, low quality ventures have an incentive to oversell their prospects (in the prospectus) in order to raise as much money as cheaply as possible (Levy and Lazarovich-Porat, 1995). With this in mind, researchers have argued that high quality new ventures can take certain actions to signal the value of their new venture. For a signal to be useful, it must be difficult or costly for others to imitate. For example, Leland and Pyle (1977) provided a model in which entrepreneurs signal the value of their ventures by the percentage of ownership retained. Those entrepreneurs retaining higher ownership after the IPO retain greater (undiversified) risk and thus provide a signal that their ventures have projects of higher value or less risk. In addition to retained equity ownership, there have been other signals of quality identified. For example, Deed, DeCarolis, and Coombs (1997) found that biotech firms can signal their scientific capabilities via patenting competences and thereby raise more capital at the time of the IPO. Similar logic has been used to explain the value of venture capitalists. For example, Megginson and Weiss (1991) argue that venture capitalists certify the value of the ventures they back to high prestige underwriters. Thus, venture capital backing provides a signal of venture quality to high prestige underwriters. Furthermore, high prestige underwriters provide a signal of quality to potential investors in the IPO

(Carter and Manaster, 1990) and to investors in seasoned offerings (Helou and Park, 2001).

At issue behind signaling is the idea of reducing the likelihood of adverse selection given the investors' bounded rationality. At the time of the IPO, investors must be concerned about adverse selection arising from duplicity on the part of the entrepreneurs receiving funding. New ventures often seek to exploit new technologies or new markets about which most investors lack information (Gompers and Lerner, 1999; Amit, Brander and Zott, 1998). Furthermore, many new ventures lack an operating history which would provide potential investors credible information about the organization. If the management team of the new venture were to claim that an opportunity was stronger than it really was or that the R&D investments were more successful than they truly were, investors lacking sophisticated or specialized knowledge would have no way to verify the credibility of the management team's pronouncements. Without any safeguards in place, the investors' uncertainty concerning the value of the venture would remain high and this uncertainty would require a severe discount to induce investment (Rock, 1986). For ventures which are "telling the truth," this discount in the form of underpricing at the time of the IPO represents needlessly foregone wealth. In addition to the loss of this wealth, these ventures may be required to pay a premium to the underwriter. That is, investment bankers underwriting the stock will have to expend greater effort to market and sell the shares of stock thereby requiring higher underwriting fees (Miller and Johnson, 1988). On the other hand, new ventures with an established operating history will pose less information asymmetry for potential

investors and therefore should require less underwriter effort to market the shares and should further suffer less underpricing.

Given the significant information asymmetry surrounding the new venture with solid growth prospects – especially one without a lengthy operating history, the question remains, "how can the organization reduce investors' information asymmetry and uncertainty?" Williamson (1996) has stated that credible commitment contained in three different types of mechanisms acts to reduce the uncertainty surrounding any (non-spot) transaction. These mechanisms include trust built up through multiple transactions, greater information disclosure, and bonding. For the IPO, trust built up through multiple transactions is not applicable for investors. A signal, however, provides evidence of value and acts as the embodiment of greater information disclosure. For example, venture capital backing represents a stronger control over the likelihood of adverse selection due to the expertise of venture capitalists (Barry, Muscarella, Peavy, and Vetsuypens, 1990). Because venture capitalists specialize in new venture investments, they tend to develop industry-specific knowledge (Amit et al., 1998) which assists them in providing added value to the ventures they back (Sapienza, 1992) and aids them in discerning the quality of any given venture. Similarly, high prestige underwriters and scientific capabilities represent superior information disclosure that evidences quality in the organization. The investor observing these signals would likely perceive less ex ante uncertainty and would anticipate a tighter distribution of results concerning future cash flows compared to the situation where these signals were lacking (Bloomfield and Wilks, 2000). That is, the investor would be able to trust the information concerning the prospects of the organization provided by the management team in the prospectus if this

information were certified via venture capital backing, prestigious underwriter backing, or credible scientific capabilities (in the form of patents and patent applications).

Bonding is the final element which can help to reduce the uncertainty surrounding any non-spot transaction (Williamson, 1996). Within the IPO context, the lockup period (as well as the percentage of shares locked up) can act as a bonding mechanism for the entrepreneurs seeking to take their venture through the IPO. That is, by increasing the length of the lockup period, the new venture's entrepreneurs provide evidence to potential investors that the entrepreneurs will not engage in acts of moral hazard because the consequence of these acts will affect them more severely due to their illiquid position. For example, if entrepreneurs oversold the merits or prospects of the venture in the prospectus, investors (not subject to the lockup period) could immediately divest their ownership once they obtained more information indicating the true (weaker) prospects for the venture. This would create a sudden drop in the value of the shares held by the entrepreneurs and would result in a severe loss of wealth for the entrepreneurs.

Bonding – A More Costly Signal

As indicated earlier, a signal reduces the uncertainty for investors because it provides greater information that is believed to be trustworthy. On the other hand, a bond is actually a stronger form of a signal because it provides a guarantee of the information presented. That is, if the information is incorrect, the one providing the information will suffer a loss. Within the IPO context, we can provide a hierarchy of signals based on the potential loss to the one providing the signal (if the signal is a deception).

In the case of scientific capabilities, the new venture providing this signal does not guarantee the information. The potential investor can observe the R&D intensity of the organization and identify the fruits of this activity (in the form of patents obtained and patents applied for) but whether these patents and patent applications will translate into positive cash flows for the organization is unknown. The same investor examining a similar venture with similar R&D activity but less in the way of patenting activity must naturally question whether this R&D activity is profligate or misguided. Thus, although the credible scientific capability provided in a signal is difficult to imitate, if the patents obtained and patents applied for never generate future cash flows, the organization providing this signal is not punished with additional losses and is benefited by not having to suffer significant underpricing merely to attract investors.

As noted above, prior literature has identified prestigious underwriter backing as an important signal to potential investors in an IPO. Yet this backing also provides a bond of sorts as well. Prestigious underwriters have developed their reputation for strong due diligence over time. This reputation for strong due diligence has further resulted in the development of a reputation for reliability and legitimacy (Suchman, 1995) within the underwriting industry. If a prestigious investment banker were to underwrite the shares of an organization providing duplicitous or deceptive information, the revelation of this deception would ultimately harm the underwriter's reputation. In this situation, the prestigious backing would benefit the duplicitous new venture by providing benefits like greater institutional holdings (Higgins and Gulati, 2003) at a lower cost. However, once the truth was revealed concerning the new venture, the underwriter would suffer a loss to its reputation. This damage to its reputation would

likely hurt the underwriter's ability to attract institutional investors for future deals. Consequently, the prestigious underwriter has a strong incentive to ensure the information concerning the new venture is accurate (Carter and Manaster, 1990). In sum, the higher the reputation of the underwriter, the stronger the bond provided potential investors in any stock backed by the underwriter. In this case, the potential loss associated with this type of bond is intangible in the form of the prestigious underwriter's reputation.

Venture capitalist backing provides a similar type of bond as that provided by prestigious underwriters. A VC's reputation is of the utmost importance because it impacts the extent to which a VC will be able to raise future capital for a new venture fund, maintain active ties with prominent underwriters, and establish ties with other VCs in order to syndicate their investments (Busenitz, Arthurs, Johnson, Hoskisson, 2004). Any VC backed IPO which propounded inaccurate information concerning the prospects for future cash flows would harm the reputation of the venture capitalists providing the backing. This in turn would impede the ability of the venture capitalists to attain high prestige underwriters for future deals. Because VCs often attempt to bring younger firms to IPO faster (Gompers and Lerner, 1999), prestigious underwriter backing is especially helpful in marketing the shares to institutional investors. Additionally, a VC with reputation problems would likely have problems trying to build a syndicate of venture capitalists for the funding of any other ventures and would likely find it difficult to attract wealthy individuals to invest in any future funds. As such, the venture capitalist has a strong incentive to protect his or her reputation. Whereas venture capital backing provides an intangible bond wherein the VC's reputation is at stake, it may also

provide a tangible bond if the venture capitalist has invested his or her own personal money in the venture fund providing the backing. After putting together a venture investment portfolio fund, VCs allocate the money from their fund to various new ventures. Once they invest in a new venture, they typically become active investors (Gompers and Lerner, 1999). Indeed, it is not unusual for venture capitalists to attain controlling interest and domination over the board of directors of a new venture after providing funding (Kunze, 1990). For this reason, VC backing provides an intangible bond and may provide a tangible bond if the venture capitalist's own money has been invested in the new venture. Although the tangible bond is potentially costly to the venture capitalists, it is likely much less costly to them than to the entrepreneurs enduring a longer lockup period because venture capitalists possess a portfolio of diversified investments.

Given the bonding effects of a longer lockup period, we argue that it acts as a signal in that it communicates greater information about the beliefs of the entrepreneurs and provides greater information about their potential future actions. Notice that the bonding provides evidence of quality in that entrepreneurs would not be willing to subject themselves to a longer lockup and would not retain higher ownership if the venture's projects were of less value than that communicated to investors (Leland and Pyle, 1977). Thus, the lockup period is not only a bond but also a signal much like venture capital backing, high prestige underwriting, and greater scientific capabilities. It is important to note, that a longer lockup is a costly signal in that it represents liquidity constraints which impose greater risk on the entrepreneurs. That is, the entrepreneurs enduring a longer lockup period are willing to suffer the risk of loss associated with any

sudden change in the market. In this case, the potential loss associated with this type of bond is tangible in the form of the entrepreneurs' wealth.

Insert Figure 1 about here

LOCKUP PERIOD

Longer Lockup Period in Lieu of Higher Quality Signals

As stated previously, signaling research in the past has focused on signals from high value firms. To this end, venture capital backing, high prestige underwriters, and scientific capabilities have all acted as signals of quality in entrepreneurship research (Megginson and Weiss, 1991; Carter and Manaster, 1990; Deeds et al., 1997; Helou and Park, 2001). Oftentimes, prestigious investment bankers are able to identify less risky or larger ventures to underwrite (Johnson and Miller, 1988). These ventures enjoying the luxury of prestigious underwriter backing do not need to further signal through the tangible bond of a longer lockup period. Similarly, those ventures enjoying demonstrated scientific capabilities or venture capital backing also can avoid the additional tangible bond (and potential loss) of a longer lockup period.

If the entrepreneurs believed that their venture is of high quality, but were lacking these other signals, it would make sense for them to signal this quality through an extension of the lockup period. In this situation, the lockup period becomes a form of credible commitment because it acts to bond the entrepreneurs to the future success of the venture. Furthermore, this activity makes a hostage of the entrepreneurs' wealth that is locked up in the venture (cf. Williamson, 1983). A lengthier lockup period represents a cost to the entrepreneurs in that their wealth is much less liquid. However, this longer

lockup period may assuage investor concerns in that the investors would have more time (and more information) to properly value the firm. Additionally, it would give the entrepreneurs more time after the IPO to demonstrate the value of their venture. On the other hand, those ventures that are able to signal with scientific capability, venture capital backing, and the underwriter's reputation would not need to suffer the additional cost or risk of the lengthier lockup as a signal. Consequently, the lockup period may be used as an alternative signal much like an alternative governance mechanism when more attractive options are unavailable (Rediker and Seth, 1995). With this in mind, we believe that the lengthier lockup period is used in lieu of the other signals when those signals are unavailable to a firm. In sum, if indeed the lockup period is also a signal, we should expect those signals of quality to predict the length of the lockup period and propose the following:

> H1: Signals of firm quality (e.g. scientific capabilities as indicated by patent intensity and patent application intensity, venture capital backing, and prestigious underwriter backing) will be significant predictors of the lockup period.

Furthermore, if the lockup period is a substitute signal, we predict a negative relationship between it and the signals of quality and propose the following:

> H1A: There will be a negative relationship between the scientific capability (as measured by patent intensity) of the new venture and the length of the lockup period.
>
> H1B: There will be a negative relationship between the scientific capability (as measured by patent application intensity) of the new venture and the length of the lockup period.
>
> H1C: There will be a negative relationship between the existence of venture capital backing and the length of the lockup period.
>
> H1D: There will be a negative relationship between the reputation of the underwriter and the length of the lockup period.

Lockup Period to Overcome Unfavorable Information

Whereas we believe that the lockup period can be used in lieu of the other types of signals detailed above, we are also interested in examining whether it is used to overcome potentially negative or unfavorable information. Negative or unfavorable information about the firm would intrinsically increase the uncertainty for potential investors and would likely require a significant discount for them to invest in the new venture (Bettis, 1983). If this uncertainty were too high, the new venture would not be able to secure the service of an underwriter. With this in mind, entrepreneurs that were optimistic about the future prospects of the firm would likely seek to reduce investor concerns. Again, by providing a longer lockup, the entrepreneurs could signal this belief about the quality of their venture especially if the other signals of quality such as VC backing were unavailable. To this end, we believe there are some new ventures that may not have the option of going through an IPO unless the entrepreneurs are willing to endure a lengthy lockup period. Ventures demonstrating extraordinarily high risk would fall into this category. As such, we have identified two measures of ex ante uncertainty concerning new ventures below and probe their impact on the lockup period.

The SEC mandates that within the prospectus of every new venture, the management team explicitly list and discuss each of the risk factors facing the new venture. These risk factors have been used in the past as a measure of the amount of uncertainty facing the organization (cf. Beatty and Zajac, 1994; Jenkinson and Ljungqvist, 2002). A greater number of risk factors would increase the uncertainty for potential investors and would likely require a discount for them to invest in the new venture. With this in mind, we propose the following:

H2A: There will be a positive relationship between the number of risk factors facing the new venture and the length of the lockup period.

In addition to the number of risk factors facing a new venture, poor prior performance would also increase the investors' uncertainty concerning the future performance and survival of the new venture. In particular, unfavorable information provided by any auditors would likely create additional uncertainty for potential investors. Within each prospectus, the auditing firm provides a statement explaining whether the new venture's accounting methods conform to generally accepted accounting principals (GAAP) and accurately reflect the condition of the organization. Additionally, if the auditor believes that the new venture is at risk of imminent failure given its current debt levels and its ability to make interest payments, it must specify that the new venture is a going concern risk. This particular statement would be very damaging for the new venture because investors are likely to place greater emphasis on the expert testimony of auditors that have been contracted by the new venture. Again, we believe that entrepreneurs will use the lengthier lockup to assuage investor concerns and propose the following:

H2B: There will be a positive relationship between the existence of a going concern statement (from the auditor) and the length of the lockup period.

Lockup Period and Its Impact on Underpricing

Signals have been used to reduce the information asymmetry and uncertainty concerning the value of a new venture. When uncertainty concerning an organization is high, greater underpricing is an expected outcome (Grinblatt, and Hwang, 1989; Welch, 1989). That is, when ex ante uncertainty concerning a new venture is higher, potential

investors will have greater difficulty pricing the shares; the distribution of their expected returns should be very broad representing higher risk (Diamond and Verrecchia, 1991). Therefore, we should expect higher undperpricing for those new ventures with a higher number of risk factors identified and higher underpricing for those new ventures with a going concern issue. In order to encourage the purchase of these shares, underwriters will be forced to underprice the stock (Jenkinson and Ljungqvist, 2002). For the new venture, this higher underpricing is possibly a necessary evil in that it allows the firm to raise capital through the offering but it also represents wealth that was "left on the table" (Daily, Certo, Dalton, and Roengpitya, 2003). By utilizing a longer lockup period, however, entrepreneurs may be able to reduce investors' uncertainty about the new venture in general and may be able to reduce the amount of underpricing. This reduction in underpricing is a benefit to the venture because it represents an increase in the wealth that is appropriated by the new venture (Certo, Covin, Daily, and Dalton, 2001). Because we are interested in observing whether the lockup period is used to overcome unfavorable information, we focus our attention on the interaction between the existence of this unfavorable information (which would increase investor uncertainty concerning the organization), and the length of the lockup period and the subsequent impact on the level of underpricing. With this in mind, we propose the following:

> H3A: The lockup period moderates the relationship between the number of risk factors and underpricing such that an increase in the length of the lockup period negatively impacts the relationship (e.g. reduces the amount of underpricing).
>
> H3B: The lockup period moderates the relationship between the existence of a going concern issue and underpricing such that an increase in the lockup period negatively impacts the relationship (e.g. reduces the amount of underpricing).

METHODOLOGY

Sample

To test the hypotheses, a sample of ventures that had gone through an initial public offering (IPO) between 1990 and 1994 was created. Given that IPO markets experience major fluctuations and assuming that there is no such thing as a "typical" IPO year (Beatty and Zajac 1994), the time frame selected spans multiple years while also omitting extremely low or high volume years. Our sampling frame was comprised of 422 firms in technology-based industries that went through an IPO in the U.S. market during this timeframe as identified through the *New Issues* database produced by Thomson Financial. The prospectuses of each firm provided the information in this study for all independent variables. Firms with fewer than 10 employees were eliminated in order to reduce the number of marginal firms in the sample. Missing data within the prospectuses as well as firms going through a seasoned equity offering (SEO) improperly identified as IPOs as well as those going through an LBO were further eliminated thereby reduced the sample size to 313 firms.

Measures

Dependent variables. There are two dependent variables in this study. The first dependent variable for the first two hypotheses is the lockup period. Because ventures can have different lockup periods with their underwriter, we calculated the lockup period as a weighted average of the number of days that a share agreement is in effect. For example, if a venture had two lockup agreements one for 180 days locking up 1,000,000 shares, and one for 360 days locking up 1,000,000 shares, the weighted average lockup

period would be 270 days. The second dependent variable used in the third group of hypotheses is the one-day trading period returns (e.g. the amount of underpricing). This variable is calculated as the first-day closing price minus the offer price divided by the offer price (Daily et al. 2003). The offer price was obtained from the final prospectus and the first-day closing price was obtained from the CRSP data tapes. A positive return represents underpricing by the underwriter and indicates value that was not appropriated by the new venture. Thus, a positive return on the first trading day represents an unfavorable outcome for the new venture.

Independent variables. The independent variables in this study were obtained from the prospectus of each venture. Patent intensity provides a signal of the organization's R&D ability and represents a signal of quality. We calculated patent intensity as the number of patents divided by the number of employees within the venture. Patent application intensity provides a similar signal of the organization's R&D ability and provides evidence of latent or unrealized value for the organization. Patent application intensity was calculated as the number of patents applied for divided by the number of employees within the venture. Venture capital backing was coded "1" if the venture had venture capital financing. The reputation of the underwriter was coded from the Carter and Manaster (1990) and the Carter, Dark, and Singh (1998) scales for underwriter reputation. Jay Ritter has updated this scale on his personal website at the University of Florida. Any missing underwriters from the Carter et al. (1998) scale were cross-referenced with Ritter's information. The number of risk factors is a sum of the total number of risk factors specified in the prospectus. This has been used as a measure of uncertainty and risk in previous studies (Beatty and Zajac, 1994). Ventures were

coded “1” if they were a going concern risk according to the auditor’s statement in the prospectus or coded “0” otherwise. In testing hypotheses 3A and 3B, we used the interaction between the lockup period and the total number of risk factors and the interaction between the lockup period and the existence of a going concern. These interaction variables were entered separately into the regression equation to observe their independent impact and to avoid multicollinearity.

Control variables. In order to remove temporal and industry effects, we utilized dummy variables for the year of the IPO as well as for the 2-digit SIC code. Four additional variables were used as controls in the testing of the first hypothesis. These same controls as well as the independent variables in the first hypothesis were used as controls to test the second and third set of hypotheses. The age of the organization as well as its size (log of total assets) were coded. Additionally, the percentage of retained equity was used as a control. It is calculated as the number of shares retained after the offering by pre-IPO investors divided by the total number of shares outstanding after the IPO. We controlled for R&D intensity by using the total spent on R&D the year before the IPO divided by the number of employees in the organization. Lastly, we controlled for the number of founders still with the firm.

Statistical methods. We first conducted a t-test comparison on the median splits to examine the differences in lockup period for those ventures above the median and those at or below the median on each of the independent variables. We then utilized hierarchical regression to test our hypotheses. Two models were specified in the analysis to examine the impact of the quality signals on the lockup period. The first model includes the control variables with the lockup period as the DV. The second

model includes the controls as well as the variables used to test the first hypothesis (e.g. patent intensity, patent application intensity, VC backing, and underwriter reputation).

Three models were specified to test the second set of hypotheses. The first model includes the original control variables plus the independent variables from the first analysis (e.g. patent intensity, patent application intensity, venture capital backing and underwriter prestige) as additional controls. The second model to test hypothesis 2A added the total number of risk factors. The third model added in the variable used to test hypothesis 2B – going concern issues.

Four models were specified in the analysis to examine the impact of the interaction effects (between risk factors x lockup period and going concern x lockup period) on the amount of underpricing. The first model includes the full set of control variables with underpricing as the DV. The second model includes the main effects including the total number of risk factors, going concern, and the lockup period. The third model examines the effect of the interaction between risk factors x lockup period on underpricing. Lastly, the fourth model examines the effect of the interaction between a going concern x lockup period on underpricing. The variables used to test the interaction effect were centered.

RESULTS

Table 1 provides the mean, standard deviation, and correlations among all variables. To test for the presence of multicollinearity, we examined the variance inflation factors and found none approaching the commonly accepted threshold of 10 (Neter, Wasserman, and Kutner, 1985). This suggests that multicollinearity was not a problem.

Insert Table 1 about here

T-tests were conducted to compare the lockup period mean across the median splits for patent intensity, patent application intensity, underwriter reputation, and total number of risk factors. Furthermore, t-tests were conducted to compare the lockup period mean for those ventures with VC-backing versus those without VC-backing, and to compare the lockup period mean for those ventures with a going concern issue versus those without a going concern issue. Results of the T-tests are presented in table 2. Results indicate a significantly shorter lockup period for ventures with more prestigious underwriters and VC-backing. On the other hand, the results indicate a significantly longer lockup period for ventures with a higher number of risk factors as well as for those with a going concern issue. This would tend to suggest in general that ventures with higher uncertainty rely on a longer lockup period.

Insert Table 2 about here

Hypothesis 1 proposed that signals of quality identified in previous entrepreneurship research (e.g. patent intensity, patent application intensity, venture capital backing, and prestigious underwriter backing) would significantly predict the lockup period. Importantly, the overall change in F when adding these variables to the controls was significant. Additionally, these variables did not perfectly predict the lockup period meaning that additional variance is available thus providing evidence that the lockup period can be seen as an alternative signal used in lieu of the other signals

and not as a perfect substitute to verify the quality of the new venture and reduce investor uncertainty. Hypothesis 1A proposed that there would be a negative relationship between the scientific capability of the organization as indicated by patent intensity and the length of the lockup period. Similarly, hypothesis 1B proposed that there would be a negative relationship between the scientific capability of the organization as indicated by patent application intensity and the length of the lockup period. Our assumption was that the existence of higher patent intensity or patent application intensity would signal scientific capabilities which would reduce investor uncertainty concerning the value of the organization. Therefore, a lengthier lockup period would not be needed to assuage investor concerns about the true value of the venture. In this case, the coefficient for patent intensity was nonsignficant therefore hypothesis 1A is not supported. The coefficient for hypothesis 1B is negative and marginally significant ($p < .10$). Interestingly, in Table 4 this variable is significant ($p < .05$) when going concern issues are entered into the model. This suggests that scientific capability may act as a signal as long as it is more recent scientific activity. That is, patent application intensity indicates recent scientific capability and therefore appears to act as a signal to potential investors. This signal provides evidence of quality in the organization thereby eliminating the need for a longer lockup period.

Hypothesis 1C proposed that there would be a negative relationship between the existence of VC backing and the length of the lockup period. If VCs truly are experts at minimizing the likelihood of moral hazard, they should provide a signal to investors of this thereby obviating the need for a lengthier lockup period. The coefficient for this variable is negative and significant ($p < .05$) in support of this hypothesis.

Hypothesis 1D proposed that there would be a negative relationship between the reputation of the underwriter and the length of the lockup period. Underwriter reputation provides a certification of value to potential investors (Helou and Chou, 2001). Therefore, a lengthier lockup period should not be necessary for those ventures which are able to command a prestigious underwriter's backing. The coefficient for this variable is negative and significant ($p < .001$) providing support for this hypothesis.

Insert Table 3 about here

In hypotheses 2A and 2B, we sought to examine whether ventures with demonstrated higher uncertainty concerning their value would use the lockup period to assuage investors' concerns. Hypothesis 2A proposed that there would be a positive relationship between the number of risk factors facing the new venture and the length of the lockup period. The coefficient for this variable was not significant. Thus, hypothesis 2A is not supported. Hypothesis 2B proposed that there would be a positive relationship between the existence of a going concern (according to the auditing firm) and the length of the lockup period. The coefficient for this variable is positive and significant ($p < .05$) providing support for hypothesis 2B. Apparently entrepreneurs in ventures with going concern issues are willing to endure a longer lockup period to compensate for this potentially stigmatizing information about the company.

Insert Table 4 about here

For the third set of hypotheses, we examined the interaction effect between the total number of risk factors and the length of the lockup period as well as the existence of a going concern and the length of the lockup period. Although we expected the length of the lockup period to have a direct negative relationship with the amount of underpricing, we did not propose this as a separate hypothesis due to the fact that a longer lockup period appears to be a substitute signal when other quality signals like VC backing and high prestige underwriting are absent. Thus, we would not necessarily expect the length of the lockup period to have a significant effect unless it was combined with those variables providing evidence of increased uncertainty concerning the organization. Hypothesis 3A proposed a negative relationship between the interaction of total risk factors x length of the lockup period and the amount of underpricing. It was argued that a higher number of risk factors combined with a longer lockup period would act to reduce the uncertainty surrounding the value of the venture and would lead to more accurate pricing by the underwriter and less underpricing in general. The coefficient for this interaction effect is negative but not significant. Thus, hypothesis 3A is not supported. Similarly, hypothesis 3B proposed that ventures with a going concern issue when combined with a longer lockup period could reduce the amount of underpricing. The coefficient for this variable is negative and significant ($p < .05$) in support of hypothesis 3B. Thus, it appears as though ventures with a going concern issue can appropriate greater wealth (through less underpricing) at the time of the IPO by agreeing to a longer lockup period.

Insert Table 5 about here

DISCUSSION

The lockup period for new ventures has received little attention in entrepreneurship research. Yet it appears as though the lockup period is useful as a signal for new ventures when they lack other signals of quality and particularly when they suffer from negative information. In particular, our results reveal that the lockup period is a substitute for those ventures with a going concern issue. Furthermore, those ventures with a going concern issue can increase the amount of wealth they appropriate at the time of the IPO through their willingness to endure a longer lockup period. The lockup period's benefits come at a cost, however, in that the wealth the entrepreneurs own remains illiquid longer. For the new venture with solid prospects for future growth and survival, this longer lockup period should not prove problematic. However, when the company is a marginal venture to begin with and increasing performance problems arise after the IPO, the entrepreneurs may resort to increasingly risky decisions in order to avoid the loss of their wealth (Kahneman and Tversky, 1979) or they may escalate commitment to a losing course of action (McCarthy, Schoorman, and Cooper, 1993). In this situation, the lockup period may be detrimental to the survival of the organization and may actually precipitate its demise. Although the lockup period acts to assuage investors of their concerns over the likelihood that the entrepreneurs receiving funding will engage in moral hazard, a longer lockup period in a marginal performer may induce poor decision making and subsequent performance after all. Thus, the benefit of the longer lockup period may accrue only to those ventures with going concern issues which have solid prospects for future performance.

In our study we find that the lockup period is used in lieu of VC backing and prestigious underwriter involvement. This is not unexpected because VCs are seen as experts in governing new ventures (Amit et al., 1998). Thus, their involvement provides a signal that moral hazard on the part of the entrepreneurs receiving funding will be controlled. Likewise, prestigious underwriters provide a similar signal of quality (Helou and Park, 2001). Those ventures with the benefit of VC or prestigious underwriter backing do not need the longer lockup period to assuage investor concerns. Interestingly, venture capital backing (cf. Daily, McDougal, Covin, and Dalton, 2002), and prestigious investment banker underwriting (cf. Arthurs, Busenitz, Hoskisson, and Johnson, 2004) may come at a high price as well. Whether or not these costs exceed those of a longer lockup period remain for future examination. However, the benefit of VC and prestigious underwriter backing may transcend their ability to assuage investor concerns over potential deceit on the part of the entrepreneurs receiving funding. Their backing may also assuage investor concerns over agent incompetence (cf. Hendry, 2002). Whereas the longer lockup period tends to reduce the likelihood of acts of moral hazard, it does nothing to reduce agent incompetence. On the other hand, VC and prestigious underwriter backing may provide additional insurance against incompetence on the part of the entrepreneurs.

Interestingly, we did not find a significant relationship between patent activity and the lockup period but we did find a negative relationship between patent application activity and the lockup period. This may reflect the fact that issued patents are less indicative of the extant scientific capabilities of the organization. That is, the patent approval process may take several months if not years. Therefore, patents owned may

reflect previous scientific capabilities. On the other hand, patent applications would potentially indicate more recent scientific capabilities and thus provide some measure of a signal of current quality in the organization. Therefore, patent application activity provides potential investors a signal of quality thereby obviating the need for a longer lockup period.

Our results may have important applications to other fields of study like bankruptcy and personal performance. The types of signals available to bankrupt firms may be limited to those which include an explicit bond like personal guarantees of loans by top management or agreements to forego a salary until the organization is able to emerge from bankruptcy. In the field of personal performance, executives who have suffered a recent performance decline may need a signal like a vote of confidence or a contract extension in order to avoid the restriction of outside resources to the organization. For example, in college athletics, head coaches often receive a contract extension from the athletic director after a poor season. This contract extension provides a signal to potential athletic recruits that the head coach will remain with the program indefinitely. On the other hand, a vote of confidence carries much less weight than a contract extension. Whether or not a verbal endorsement by the athletic director would assuage potential recruits would make for an interesting study.

CONCLUSION

In this study, we examined the lockup period of a group of ventures going through an IPO between 1990 and 1994. We contribute to theory by identifying the nature of signals and how both intangible and tangible bonds are actually stronger forms of a signal in that they provide a guarantee of the information being signaled. Those

who have bonded themselves will suffer a loss if the signaled information is inaccurate. In our study, we found that the lockup period acts as a substitute signal for ventures lacking higher quality signals like venture capital backing and prestigious underwriter endorsement, and patent application intensity. Furthermore, ventures which suffer from negative information (e.g. a going concern issue reported by the auditing firm) can use a longer lockup period to assuage investor concerns over the true value of the venture. This longer lockup period is instrumental for these firms in reducing the amount of underpricing at the IPO. Thus, the lockup period represents an important signal which may be used by new ventures in order to appropriate greater wealth at the time of the IPO.

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FIGURE 1
Types of Signals in the IPO Setting and Their Costs if the Signal is Untrue

Type of Signal	Example	Risk of Loss (if signaled information is untrue)
Pure Signal	Scientific capabilities	None
Intangible Bond	Prestigious Underwriter Backing	Underwriter's Reputation
Intangible Bond	Venture Capital Backing	Venture Capitalist's Reputation
Pure Bond	Lockup Period	Entrepreneurs' Wealth

Table 1: Means, Standard Deviations, and Correlations among All Variables

	Means	Std Dev	SIC28	SIC33	SIC35	SIC36	SIC38	SIC48	SIC73	SIC80	SIC87	1990	1991	1992	1993	1994
SIC28	.07	.26	1.00													
SIC33	.01	.08	-.02	1.00												
SIC35	.10	.30	-.10	-.03	1.00											
SIC36	.20	.40	-.14*	-.04	-.17**	1.00										
SIC38	.16	.37	-.12*	-.04	-.15**	-.22**	1.00									
SIC48	.01	.11	-.03	-.01	-.04	-.06	-05	1.00								
SIC73	.25	43	-.16**	-.05	-.19**	-.29**	-.25**	-.07	1.00							
SIC80	.01	.08	-.02	-.01	-.03	-.04	-.04	-.01	-.05	1.00						
SIC87	.04	.19	-.06	-.02	-.07	-.10	-.09	-.02	-.12*	-02	1.00					
1990	.07	.25	.02	-.02	-.01	-.14*	-.05	-.03	-.10	-.02	-.05	1.00				
1991	.16	.37	-.06	-.04	-.04	-.10	.23**	-.05	-.01	-.04	.00	-.12*	1.00			
1992	.21	.41	.03	-.04	.08	-.03	.07	-.06	.02	-.04	-.02	-.14*	-.23**	1.00		
1993	.22	.42	-.00	.15**	.02	-.15**	-.19**	.08	-.03	.15**	-.03	-.14*	-.24**	-.28**	1.00	
1994	.33	.47	.01	-.06	-.06	.05	-.05	.04	.06	-.06	.07	-.19**	-.31**	-.37**	-.38**	1.00
Age F	8.92	7.32	-.10	.07	.03	.07	-.06	-.03	.12*	-.08	-.09	-.07	-.01	-.06	-.03	.12*
LgTA	6.91	.644	-.13*	.11	-.00	.21**	-.04	.13*	-.11	.11	-.13*	.02	-.08	-.04	.11*	-.01
%Lock	.578	.151	-.06	.01	.00	.05	-.09	.13*	.01	-.03	-.12*	.07	-.02	-.17**	.03	.10
R&D I	29,441	38,176	.25*	-.12*	.02	-.03	-.03	-17**	-.16**	-.12	.22**	-.00	-.05	.01	-.01	.04
Fndrs	.978	.954	-.05	.02	.06	-.01	.04	-.03	-.05	-.04	-.06	.09	.03	-.09	-.06	.07
Pat I	.038	.103	.13*	-.01	-.01	-.11*	.32**	-.09	-.34**	-.07	-.01	-.06	.03	-.03	-.07	.09
Pat A I	.051	.139	.15**	-.00	-.07	.02	.23**	-.10	-.36**	-.07	.21**	-.01	.08	-.03	-.02	-.01
VC	.530	.500	-.01	-.01	-.02	-.03	-.03	-.01	-.04	-.01	-.01	.12*	.02	.01	-.03	-.06
Uw Rp	5.81	2.54	-.08	-.01	.03	.05	-.06	.14*	-.06	.05	-.17**	.16**	-.00	-.02	-.03	-.04
RF	5.16	1.70	.12*	-.10	-.09	-.04	.27**	-.08	-.23**	-.10	.08	.01	-.04	-.02	-.25**	.27**
GC	.102	.303	.11	-.03	.03	-.12*	.20**	-.04	-.10	-.03	.04	-.05	.11	.06	-.08	-.04
LU Pd	262.14	153.26	.06	-.04	.02	-.12*	.12*	.02	-.01	-.04	.12*	-.09	.05	.01	.04	-.03
Undrpr	.104	.250	-.10	-.08	.02	-.00	.04	-.03	.09	.03	-.06	-.05	.10	-.04	.01	-.03

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Spearman rank correlations are reported where ordinal data are used.

Table 1: Means, Standard Deviations, and Correlations among All Variables (Continued)

	Means	Std Dev	Age of firm	Log of total assets	% shares locked	R&D intens.	Fndrs	Pat. intens.	Pt. app. Intens.	VC-backed	Undwrtr reputatn	# of risk factors	Going concern	Lockup period	Under pricing
Age of firm	8.92	7.32	1.00												
Log of total assets	6.91	.644	.21**	1.00											
% shares locked	.578	.151	.07	.25**	1.00										
R&D Intensity	29,441	38,176	-.22**	-.18**	-.08	1.00									
Founders	.978	.954	-.07	.03	.14*	.06	1.00								
Patent intensity	.038	.103	-.05	-.13*	-.09	.15**	.07	1.00							
Pt. app. intensity	.051	.139	-.12*	-.21**	-.09	.36**	-.04	.54**	1.00						
VC Backed	.530	.500	-.060	.11	.07	.41**	.11	.09	.11	1.00					
Underwriter reputation	5.81	2.54	.12*	.66**	.25**	.01	.05	-.20**	-.19**	.30**	1.00				
# of risk factors	5.16	1.70	-.20**	-.29**	-.12*	.20**	.04	.10	.08	.07	-.20**	1.00			
Going concern	.102	.303	-.19**	-.38**	-.25**	.17**	-.02	.09	.17**	-.13*	-.33**	.18**	1.00		
Lockup Period	262.14	153.26	-.08	-.47**	-.20**	-.01	-.12*	.15**	.11	-.35**	-.70**	.15**	.33**	1.00	
Undrprice	.104	.250	.06	.09	.13*	.03	.04	.01	-.07	.07	.26**	-.01	-.11*	-.21**	1.00

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Spearman rank correlations are reported where ordinal data are used.

TABLE 2 T-Test Results of the Comparison of the Independent Variables on Lockup Period

Variable	Above the Median Lockup Period Mean	Standard Deviation	At or Below the Median Lockup Period Mean	Standard Deviation	T-Statistic
Patent intensity	256.08	143.92	266.62	160.05	.542
Patent application intensity	255.93	132.75	267.30	168.62	.505
VC Backing[1]	214.60	96.56	315.83	184.89	5.96***
Underwriter Reputation	189.58	51.25	388.04	187.22	11.08***
Total risk factors	287.96	175.88	244.28	133.01	2.38*
Going concern[1]	414.33	208.43	244.81	135.69	4.49***

N=313 *** p<.001, ** p<.01, * p<.05, † p<.10.

[1] Binary variables – the t-test comparison of lockup period was between those demonstrating the characteristic versus those lacking the characteristic.

TABLE 3 Results of the Linear Regression Estimating the Relationship between Independent Variables and Lockup Period

Dependent Variable: Lockup Period	**Model 1: Controls**	**Model 2: Quality Signals**
Controls		
SIC28	.12	.18
SIC33	-.01	.02
SIC35	.07	.20
SIC36	-.00	.15
SIC38	.14	.24
SIC48	.03	.10
SIC73	-.06	.18
SIC80	-.01	.03
SIC87	.07	.14
YR1991	.12	.03
YR1992	.11	-.05
YR1993	.19*	-.03
YR1994	.19†	-.02
Age of firm	-.00	-.01
Log total assets	-.47***	-.02
Lockup %	-.07	-.01
R&D Intensity	-.17**	.04
Founders	-.09†	-.10*
Ind. Variables		
Patent intensity		.07
Pat. app. int.		-.10†
VC backing		-.13**
Underwriter reputation		-.63***
R^2	.291	.532
Adjusted R^2	.248	.497
F-Statistic	6.70***	14.96***
Δ R^2	.291	.241
F-Statistic for Change	6.69***	37.04***

N = 313 *** p<.001, ** p<.01, * p<.05, † p<.10
Standardized coefficients reported.

TABLE 4 Results of the Linear Regression Estimating the Relationship between Independent Variables and Lockup Period

Dependent Variable: Lockup Period	**Model 1: Controls**	**Model 2: Risk Factors**	**Model 3: Going Concern**
Controls			
SIC28	.18	.19	.19
SIC33	.02	.02	.02
SIC35	.20	.21	.22
SIC36	.15	.17	.17
SIC38	.24	.26	.26
SIC48	.10	.10	.10
SIC73	.18	.19	.20
SIC80	.03	.04	.03
SIC87	.14	.15	.15
YR1991	.03	.03	.02
YR1992	-.05	-.05	-.06
YR1993	-.03	-.04	-.04
YR1994	-.02	-.01	-.01
Age of firm	-.01	-.01	-.01
Log total assets	-.02	-.03	-.00
Lockup %	-.01	-.01	.00
R&D Intensity	.04	.04	.04
Founders	-.10*	-.10*	-.10*
Patent intensity	.07	.07	.08
Pat. app. int.	-.10†	-.10†	-.11*
VC backing	-.13**	-.13**	-.12*
Underwriter reputation	-.63***	-.63***	-.62***
Ind. Variables			
# risk factors		-.03	-.04
Going concern			.09*
R^2	.532	.533	.539
Adjusted R^2	.497	.496	.501
F-Statistic	14.96***	14.30***	14.00***
Δ R^2	.241	.001	.006
F-Statistic for Change	37.04***	.445	3.93*

N = 313 *** p<.001, ** p<.01, * p<.05, † p<.10
Standardized coefficients reported.

TABLE 5 Results of the Linear Regression Estimating the Relationship between the Independent Variables and Underpricing

Dependent Variable: Underpricing	**Controls**	**Main Effects**	**Model 1: Lockup Period x RF**	**Model 2: Lockup period x Going concern**
Controls				
SIC28	-.10	-.13	-.13	-.14
SIC33	-.03	-.03	-.03	-.04
SIC35	.03	.01	.01	-.00
SIC36	.09	.04	.03	.02
SIC38	.06	.02	.01	.00
SIC48	-.07	-.07	-.07	-.08
SIC73	.12	.09	.09	.07
SIC80	.01	.01	.01	.01
SIC87	-.07	-.09	-.10	-.11
YR1991	.17†	.19*	.19*	.20*
YR1992	.19†	.19†	.19†	.18†
YR1993	.18†	.19†	.19†	.19†
YR1994	.16	.15	.15	.15
Age of firm	.05	.05	.05	.06
Log total assets	-.17*	-.17*	-.17*	-.17*
Lockup %	.10†	.09	.09	.09
R&D Intensity	.10	.10	.10	.10
Founders	-.01	-.01	-.01	-.01
Patent intensity	.10	.10	.10	.10
Pat. App. int.	-.09	-.08	-.08	-.09
VC backing	.03	.02	.01	.03
Underwriter reputation	.33***	.31**	.31**	.35***
Main Effects				
# risk factors		.08	.08	.08
Going concern		-.08	-.08	.00
Lockup period		-.03	-.02	.07
Interaction Effects				
Lockup x Risk factors			-.03	
Lockup x Going concern				-.17*
R^2	.153	.163	.163	.177
Adjusted R^2	.088	.089	.087	.101
F-Statistic	2.37**	2.22**	2.14**	2.35**
Δ R^2	.153	.010	.001	.014
F-Statistic for Change	2.37**	1.13	.185	4.80*

N = 313 *** p<.001, ** p<.01, * p<.05, † p<.10

Standardized coefficients reported.